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THE REMARKABLE TREES
OF
HEREFORDSHIRE.

"THE HOME OAK," HAREWOOD *(Q. pedunculata).*

APRIL, 1867.

This luxuriantly growing tree promises to be very fine. It is situated by the drive leading to the house as seen in the Photograph. At five feet from the ground, where the card of the Club is placed (one foot by six inches in size), its circumference is already sixteen feet ten inches.

This Photograph is kindly presented to the Club by the President for the year, Chandos Wren Hoskyns, Esq.

(Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.)

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TRANSACTIONS

OF THE

WOOLHOPE

NATURALISTS' FIELD CLUB.

(ESTABLISHED MDCCCLI.)

1867.

"HOPE ON—HOPE EVER."

HEREFORD:

PRINTED AT THE "TIMES" OFFICE, MAYLORD STREET.

MDCCCLXVIII.

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OFFICERS FOR THE YEAR

1867.

PRESIDENT:

CHANDOS WREN HOSKYNS, Esq., Harewood, Ross.

VICE-PRESIDENTS:

The Rev. SAMUEL CLARK, Bredwardine Vicarage, Hereford.
The Rev. THOMAS WOODHOUSE, M.A., Cusop, Hay.
HUMPHREY SALWEY, Esq., Ludlow.
TIMOTHY CURLEY, Esq., F.G.S., Hereford.

HON. SECRETARY:

The Rev. G. H. CORNEWALL, B.A., Moccas Rectory, Hereford.

ASSISTANT SEC. AND TREASURER:

Mr. ARTHUR THOMPSON, Hereford.

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LIST OF HONORARY MEMBERS.

Sir W. Jardine, Bart., F.R.S., &c., &c., Jardine Hall, Dumfriesshire.

Sir Charles Lyell, Bart., M.A., F.R.S., &c., London.

Sir Roderick J. Murchison, Bart., F.R.S., &c., 16, Belgrave Square, London.

George Bentham, Esq., President of the Linnean Society, &c., London.

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Dr. H. B. Geinitz, Professor of Geology, &c., Dresden.

Professor John Lindley, Ph. D., F.R.S., &e., London.

R. M. Lingwood, Esq., F.G.S., &c.

Professor W. Melville, Queen's College, Galway, Ireland.

Professor John Phillips, F.R.S., F.G.S., St. Mary's Lodge, York.

Rev. W. H. Purchas, Falkner Street, Gloucester.

J. W. Salter, Esq., F.G.S., &c., London.

Rev. Professor A. Sedgwick, B.D., F.R.S., &c., University, Cambridge.

Edwin Lees, Esq., F.L.S., F.G.S., &c., &c., Worcester.

Sir W. V. Guise, Bart., F.G.S., &c., Elmore Court, Gloucester, President of the Cotteswold Naturalists' Field Club.

W. H. Paine, Esq., Stroud, Honorary Secretary, of the Cotteswold Naturalists' Field Club.

Rev. W. S. Symonds, F.G.S., Pendock Rectory, Tewkesbury, President of the Malvern Naturalists' Field Club.

Rev. R. P. Hill, Broomesberrow Rectory, Ledbury, Hon. Secretary.

The President of the Warwickshire Naturalists' Field Club.

The President and Hon. Secretary of the Oswestry and Welshpool Naturalists' Field Club.

The President, Curator, and Hon. Secretary of the Dudley and Midland Geological and Scientific Society and Field Club.

The President and Hon. Secretary of the Severn Valley Field Club.

The President and Hon. Secretary of the Caradoc Field Club, Shropshire.

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ORDINARY MEMBERS,

1867.

Adams, W. Esq.
Armitage, Arthur, Esq.
Banks, R. W., Esq.
Banks, Wm. Esq., F.S.A.
Bayliss, Mr. Phillip.
Bevan, G. P., Esq., F.G.S.
Blashill, Thomas, Esq.
Bodenham, C. De la Barre, Esq.
Bull, Dr.
Cam, Thomas, Esq.
Capel, Rev. Bury, M.A.
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Clive, G., Esq., M.P.
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Du Buisson, Rev. E., M.A.
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Feilden, Lieutenant Colonel.
Fowle, Rev. W. C., M.A.
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Gray, Rev. Arthur, M.A.
Greenhow, R. Esq.
Hanbury, Rev. J. Capel, M.A.
Hereford, Viscount.
Hereford, Richard, Esq.
Hereford, Rev. R., M.A.
Hernaman, Rev. J. W. D., M.A.
Hill, Rev. H. T., M.A.
Hoskyns, Chandos Wren, Esq.
Isbell, E. J., Esq.
Jenkins, Henry J., Esq.
Johnson, R. Esq., (dec).
Jones, Rev. J. Edward.
Jones, Thomas, Rev. W., M.A.
Jukes, Rev. J. H., M.A.
Key, Rev. H. C., M.A.
King, Rev. T., M.A.
Lane, Mr. Theophilus.
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Morris, J. Griffith, Esq.
Newton, Marcellus, Esq.
Pateshall, Captain.
Phillipps, Rev. Thos., M.A.
Phillips, Mr. William.
Phillott, Rev. H. W., M.A.
Poole, Rev. William, M.A.
Purchas, Alfred, Esq.
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Reaveley, Rev. F. Fenwick, S.C.L.
Salwey, Humphrey, Esq.
Scudamore, Colonel.
Smith, Rev. Charles, M.A.
Smith, J. E. Esq.
Southall, Mr. Henry.
Stanhope, Rev. B. L. S., M.A.
Steele, Elmes, Y., Esq.
Styles, R. H. P., Esq.
Thompson, Mr. Arthur.
Tweed, Rev. H. W., M.A.
Vaughan, James, Esq.
Weare, Rev. T. W., M.A.
West, Rev. T., M.A.
Westropp, Rev. J. C., B.A.
Williams, Captain.
With, Mr. George.
Wood, J. H., Esq.
Woodhouse, Rev. T., M.A.
Wynne, N. S., Esq.

[New Members.

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NEW MEMBERS ELECTED DURING THE YEAR

1867.

Allen, B. Haigh, Esq.
Arkwright, John H., Esq.
Beavan, Rev. T. M., B.A.
Bonnor, W. J., Esq.
Broughton, F., Esq.
Capper, Rev. D. P., M.A.
Capper, R. Harcourt, Esq.
Cooke, Wm. Henry, Esq., Q.C.
Davies, James, Esq.
Downing, J. B., Esq.
Dumbleton, H., Esq.
Evans, E. M., Esq,
Fowler, J. T. Owen, Esq.
Harrison, D. R., Esq.
Hereford, Captain
Husbands, E. T., Esq.
Llanwarne, Thomas, Esq.
Lloyd, Mr. James., W.
Owen, Evan, Esq.
Owen, Rev. E. J.
Palin, Rev. Edward, B.D.
Pitt, Mr. John.
Raven, Rev. John.
Shellard, O., Esq.
Stanhope, Rev. Wm. P. S., M.A.
Stillingfleet, Rev. H. J., M.A.
Thirlwall, Rev. T. J., M.A.

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RULES

OF THE

WOOLHOPE NATURALISTS' FIELD CLUB.

I.—That a Society be formed under the name of the "WOOLHOPE NATURALISTS' FIELD CLUB," for the practical study, in all its branches, of the Natural History of Herefordshire and the districts immediately adjacent.

II.—That the Club consist of Ordinary Members, with such Honorary Members as may be admitted from time to time; from whom a President, four Vice-Presidents, a Central Committee, Treasurer, and Honorary Secretary, be appointed at the Annual Meeting to be held at Hereford in the early part of each year. The President and Vice-Presidents to change annually.

III.—The Central Committee shall consist of three members, resident in the city or in its immediate vicinity, with the President, Vice-Presidents, and Honorary Secretary *ex-officio*. It shall be empowered to appoint an Assistant Secretary; and its duties shall be to make all the necessary arrangements for the meetings of the year, and take the management of the Club during the intervals of the meetings.

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IV.—That the members of the Club shall hold not less than three Field Meetings during the year, in the most interesting localities for investigating the natural history of the district. That the days and places of such regular meetings be selected at the Annual Meeting, and that ten clear days' notice of each be communicated to the Members by a circular from the Secretary; but that the Central Committee be empowered, upon urgent occasions, to alter the days of such regular Field Meetings, and also to fix special or extra Field Meetings during the year.

V.—That an Entrance Fee of Ten Shillings shall be paid by all Members on election, and that the Annual Subscription be Ten Shillings, payable on the 1st of January in each year, to the Treasurer, or Assistant Secretary. Each Member may have the privilege of introducing a friend on any of the field days of the Club.

VI.—That the Reports of the several meetings, and all the papers read to the Club during the year, be forwarded to the *Hereford Times* newspaper for publication as ordinary news, and that the type be re-set in octavo at the expense of the Club, to form (with such additions as may be deemed advisable) the Transactions of the Club.

VII.—That the cost of any lithographic or other illustrations be defrayed by the author of the paper for which they may be required, unless the subject has been taken up at the request of the Club, and in that case, the cost of such illustration to be paid for from the Club funds, must be specially sanctioned at one of the general meetings.

VIII.—That the President of the year arrange for an address to be given in the field at each meeting, and for papers to be read after dinner; and that he

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be requested to favour the Club with an address at the Annual Meeting, on the proceedings of the year, together with such observations as he may deem conducive to the welfare of the Club and the promotion of its objects.

IX.—That all candidates for Membership shall be proposed and seconded by existing Members, either verbally or in writing, at any meeting of the Club, and shall be eligible to be ballotted for at the next meeting, provided there be FIVE Members present; one black ball in THREE to exclude.

X.—That Members finding rare or interesting specimens, or observing any remarkable phenomenon relating to any branch of Natural History, shall immediately forward a statement thereof to the Hon. Secretary, or to any member of the Central Committee.

XI.—That the Club undertake the formation and publication of correct lists of the various natural productions of the County of Hereford, with such observations as their respective authors may deem necessary.

XII.—That Members whose subscriptions shall remain for *three* years in arrear after demand, be held to have withdrawn, and their names shall accordingly be omitted from the list of Members at the ensuing Annual Meeting.

XIII.—That the Assistant Secretary do send out circulars ten days at least before the Annual Meeting, to all Members who have not paid their subscription, and drawing the particular attention of all those that may be affected by the operation of Rule XII, to that Rule.

XIV.—That these Rules be printed annually with the Transactions, for general distribution to the Members.

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"THOU ART IN SMALL THINGS GREAT, NOT SMALL IN ANY;
THY EVEN PRAISE CAN NEITHER RISE NOR FALL.
THOU ART IN ALL THINGS ONE, IN EACH THING MANY:
FOR THOU ART INFINITE IN ONE AND ALL."

George Herbert.

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ADDRESS OF THE RETIRING PRESIDENT,

(CHANDOS WREN HOSKYNS, ESQ.,)

READ AT THE ANNUAL MEETING, THURSDAY, MARCH 26, 1868.

GENTLEMEN,—The survey of the past year's proceedings of the Woolhope Field Club, which has usually formed the chief topic of that Parthian demonstration concluding the term of presidential office, is now, by a very happy arrangement of the Central Committee, assisted by the liberality of the Press, presented to you in so detailed a form, photographed, as it were, from the sunny life of each day's Field operations, that I should be occupying your time unprofitably by attempting to present even in miniature what is placed before you elsewhere in full life size, and fixed in permanence on the pages of the printed Transactions of the year.

Indeed, if I were to act out my moribund character to the life, or rather to the death, according to the modern pattern of a president under impeachment, and end my term of office by what is called "making a clean breast of it" at once, I am not sure, in view of the increasing number of scientific societies and annual addresses exemplified during the period, whether I should not breathe a hope that amongst the many revolutions in the political, the social, and the scientific world, with which we seem to be specially contemporary—that the whole generation of annual addresses may, like other ancient forms that have fulfilled the era of their utility, be gradually approaching a sort of Cataclysm destined to relieve a double exhaustion at once, that of the speaker's matter and the hearers' patience.

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The truth is that science does not run fast enough for the requirements of its modern machinery. The draught upon address-matter exceeds the supply of the material even from nature's fertile store-room. The footsteps of patient study and research seem never so slow as when the eye is cast over the space of a single year. It is true that there is, pervading almost every province of intellectual exertion, much of that "raw haste" said to be "half-sister to delay." Yet, when we look at the course of discovery that we can each remember, and at the immense accession to our knowledge that has been made step by step, sometimes a little faster than at others, but always slowly in the eyes of those who look for great results, we shall find no cause for regret if the record of a single year may seem but small in compass.

It is one advantage of modern science, as evidenced in societies like our own, and this especially applies to Geology, that whatever step is made, is sure, because it is subjected at once to a field of publicity and scrutiny which is itself daily widening; and whilst our visit to each new locality imparts fresh knowledge to ourselves, it leaves behind, upon the spot, stimulating incidents and memories which rouse dormant or diffident minds into activity; and many a healthy local influence is found to begin its career upon the spot we have appeared in, long after our visitis over.

It cannot be said that the past year was an inactive one on the part of our Club. We began it on the breezy summit of the Herefordshire Beacon, on a day which though opening unpromisingly on the part of the weather, attracted a fair attendance of members during a walk stretching across the most conspicuous line of country that we can call ours, and one not easily forgotten.* Our next Field day took us right across from the N.E. to the extreme West of our territory; indeed, across the Border, into the neighbouring Principality; and I should think the Well-house of Llandrindod has seldom witnessed so large an influx of visitors bringing so little gout, and taking away so little of its waters.

That the subsequent Pic-nic to the Waterfall of Craig-y-pwl-ddu was a success, I know, but with the regret of having been prevented from being present at that pleasant assemblage. The fixture at Clun to meet the members of the Caradoc Field-club, and the British Archæological Association at Ludlow, afforded a day of very great interest, again somewhat interrupted by the weather, and involving a walk of rather more than usual length and fatigue. Yet I confess to have scarcely satisfied my curiosity (in spite of the archæologists) on the subject of the gigantic diggings of the Bury Ditches; and I should like to see some more exact investigation of their origin.

Our last visit was where all visitations should terminate, at home; and in the Woolhope Valley of elevation we certainly have a Home with which the

* The remembrance of Colwall admonishes us that we must not borrow etymology from Domesday-book.

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modern Silurians may well be content, and venture to defend against all comers. It is to me a matter of no small congratulation that the district embraced by our club is one so rich in the more difficult and remote problems of Geology, and the still more interesting one of Palæontological research. Of all the physical sciences of our time, Geology may be called the most advancing, in the sense of a pursuit coupled with the prospect of discovery. This is encouragement, even to beginners, to work with the unfailing energy of hope; since the prize of discovery is held before all, and the hidden treasures stored away in the rocks only await the touch of that zealous and fortunate hand that shall release and secure them. To a persevering geologist of our day everything seems to lie open and possible. If he is blest with true luck, who can say (since the last edition of the *Siluria*), that he may not find a Fish, or even a Mammal, in the Wenlock Limestone? and thus astonish the whole geological world, as much as the astronomer who has found a new asteroid, or the re-appearance of the lost twin of a double star. It was only by such "persistent constancy" of patient research that Sir Roderick himself collected the materials of that great work of which the past year has given us the 4th edition. In this he gives us a still larger knowledge of the oldest and lowest rocks, occurring in N. America and elsewhere in the form of Chrystalline Gneiss, and now called "Laurentian," which constitute the foundation stone of all Palæozoic deposits in the crust of the globe. The Cambrian rocks of the Longmynd, 26,000 feet thick, and of North Wales, are now no longer the bottom rocks, and are known to contain some traces of marine animal life. In the Lingula Flags which succeed, 5,000 feet thick, many new and interesting forms are specified, especially the *Trilobites paradoxides*, and others. The succeeding Llandeilo formation, also 5,000 feet, is largely treated of, with its abundant Trilobites, Graptolites, and other fossils. Passing upward through the Caradoc sandstone, Llandovery beds, and Wenlock limestone, the interesting discovery of the remains of a fish *(Pteraspis Tradensis)* the oldest known vertebrate, at Leintwardine in this county, is alluded to; 300 additional Silurian species of fossils are given, and several of the published species are omitted, being identified with others previously described; and some well-known names have been exchanged for more correct ones, as a more extended knowledge of these primeval forms of life has been obtained. A much larger number of Trilobites is given, including many new species. An important alteration has been made in the classification of the supposed Old Red of Elgin in Scotland, by the identification of the *Hyperodapedon* of the New Red Sandstone (Lower Keuper) of Warwick, with the same reptile at Elgin, the sandstone of which is now referred with the other reptilian vestiges it contains *(Teterpator* and *Staganolepis)* to the Trias. I will conclude this very brief notice with the expression of my hope that this important Work may be purchased for our Library.

But outside the immediate proceedings of our Club, the year has not been one by any means barren of general scientific incident. This we must in any case admit, in view of the great French Exhibition, which has afforded the

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opportunity for a basis of comparative national progress, the widest that the world has yet seen, if not the best. The scientific sections of these international displays are among the least prominent of their features, from causes incident to their very nature; but every arrangement was made that the most ambitious organization could devise for rendering the gathering as effective as possible, as a *réunion* of science and its professors, as well as of art and industry. But we are not now to learn how coyly and reluctantly science lends herself to those arenas where display forms the leading object. If this was felt, as I know personally how much it was felt amongst those in our own agricultural department, who desired those accurate Tests of merit to which they had been used, I must not be surprised if this want was experienced in those departments directed to Science.

One of the most striking features characterising the past year has been the occurrence of a more than usual share of those events, which popularly regarded as physical calamities, must yet be looked upon with active interest by men of science as affording opportunities for the study of the more energetic phenomena of nature rarely to be seen except under the conditions of special disturbance. Of this class was the extraordinary hurricane and earthquake in the West Indies at the Island of St. Thomas. As resulting from which, we were startled by some intelligence which made me feel that if I had not (like one of my predecessors in this chair) an Earthquake in Herefordshire to report, I might yet console myself with the unprecedented event of the total disappearance of a definite portion of the earths' surface with all its inhabitants at one fell swoop of the Atlantic; the awful intelligence having reached us by telegraph of the total submergence of the Isle of Tortola, and the destruction of 10,000 souls! But while the public were agape with dismay at so wholesale a destruction, and awaiting with intense anxiety the more detailed particulars of the event, there appeared in the interval a brief and modest letter to the *Times*, in which it was stated that such an event was contrary to the whole experience derived from the records of natural phenomena—at least since the Deluge—and on this ground alone venturing to re-assure the minds of those whom it might concern. In due course the corrected intelligence came, and proved that the man of science was a true prophet (in the most legitimate modern sense of that word), and that Nature, like her great Author, was not quite so cruel as men had represented.

After this disturbance in the Western Hemisphere came the interesting accounts of the sudden activity of Vesuvius, followed by the terrible calamity of the fall of the cliff on the borgo of Sta. Lucia, at Naples. I am not aware of any prescribed limit that exists to subterranean force, which should forbid the supposition of a connection between volcanic action in all parts of the globe. What is very interesting in relation to the recent and still existing eruption of Vesuvius is the confirmation by Professor Palmiera, of the discovery made by our countryman, Hamilton, of the periodicity of the action, and its dependence on lunar

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influence, the retard of each day's Lava-stream being found to be nearly identical in character with that of a tide. Such is the precision of the instruments of the observatory, which have been used during this eruption, that a person, even with the windows closed, and without seeing Vesuvius at all, can tell with accuracy what are the conditions of the eruption. The observations were commenced during the long-continued eruption in the year 1855: at that time a diurnal period was marked by Hamilton, who from his limited number of observations deduced the fact of the recurrences being at fixed hours. This has now been so completely confirmed, that nothing is wanting, but a *good path*, to enable visitors to know the exact hour at which they should be near the summit, without any risk from projectiles or the burning Lava. So that the man of science may say of a burning mountain even in the whirlwind and fury of its passion,

"Though this be madness, yet there's method in it."

Indeed one could hardly have, in present state of physical knowledge, a more striking proof of the prevalence of law than that afforded by this discovery.

While on the subject of the destructive powers of Nature, I cannot help referring to one frequent cause of loss of life, of which a notable instance occurred in the explosion at the Oaks Colliery. It is probably known to many of my hearers, that with that fearful catastrophe ended—only for a time I hope—an experiment hardly inferior in importance to any that could be entertained in a coal-mining country. I allude to the project of applying that terrible enemy the Fire-damp (as it is called) of coal mines to the purpose of their own illumination. The problem remained—if I cannot say a successful, still a practicable one—from the year 1862 down to the time of the explosion—a period of four years—during which sixty burners were acting most satisfactorily day and night. The accident, however terrible in extent, should not be allowed to discourage a project in itself so interesting to humanity as well as to science. It is already certain that coal cannot be obtained without the release of this gas, in variable quantities; and it would appear from that experiment that the chief if not only source of danger lies in the difficulty of collecting the whole of it into the apparatus employed for that purpose; that which escapes over being found to exert its most formidable explosive powers as soon as it has united with itself nine times its own volume of atmospheric air. As, however, this is artificially supplied to a Mine, the problem of preventing the insidious process of a union so disastrous may not be so hopeless as it might otherwise appear. We have already harnessed the lightning to our service, and compelled it to make its pathway under the ocean; and if this gas can be so bitted and bridled to its proper use, instead of venting itself in wild mischief, its value would be enormous. It is manufactured by nature's laboratory, without retorts, or stokers, or machinery, on a scale of magnitude of which we hardly can form a calculation; but it would appear that there is a ready-made store of gas in the mines sufficient to light them up effectually, and at the same time remove an ever present and accumulating source of danger to health and human life. It

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appears that since the closing of the pit after the explosion, the whole mine has become one huge gasometer, giving off at times 50,000 cubic feet of gas per hour, a quantity sufficient to light up every thoroughfare in the neighbourhood. The awful check which the experiment, after so long and promising a period of success, received from this accident, deeply as it must be regretted, should not make us forget that at the door of almost every great discovery there has been this "stumble on the threshold," this martyrdom of a few in the great cause of humanity: but surely it is no ignoble death thus to fall in the foremost rank, the glorious "forlorn-hope" of the eternal battlefield of Science? It was a great philosopher as well as poet who said:

> The ample proposition that hope makes
> In all designs begun on earth below
> Fails in the promised largeness.—Checks and disasters
> Grow in the veins of actions highest reared,
> As knots by the conflux of meeting sap
> Infect the sound pine, and distort his grain,
> Tortive and errant, from his course of growth.
> Sith every action that hath gone before
> Whereof we have record, trial did draw,
> Bias and thwart not answering the aim,
> And that embodied figure of the thought
> That gave't surmised shape.
> Which are nought else
> But the protractive trials of great Jove
> To find persistive constancy in men.
>
> *Troil. and Cres., I., 3.*

Before I conclude, allow me to say one word upon a subject which may perhaps be as interesting to other members of Field clubs as it has been to myself, and which, for very obvious reasons, may fairly come under our notice. I allude to the prolonged delay, I should rather say the total stop that has taken place in the cadastral Survey of the midland and southern counties. The old Ordnance maps are becoming every day more antiquated and unreal; indeed they are now doing positive mischief, by being used as data for new maps constantly put forth for purchase by the public. I believe that the cost of the 6-inch scale, applied to Ireland and our northern counties, and which was intended to be continued over the rest of the kingdom, is not appreciably greater than the 1-inch scale, with which we have to be satisfied. And the same remark applies to the proposed 25-inch scale which was reported in favour of in consequence of certain geometrical advantages applicable to that scale, besides the practical utility of its affording (within a fraction) a square inch to the acre, not to say anything of its immense importance to Geologists. I believe that nothing is really wanting but that useful operation which has been called "kicking the shins of Government" to get this subject attended to, and a great boon to the whole community carried out. The advantages which would accrue from the possession of a perfect map on this noble scale, are greater and more various than can be easily enumerated. I cannot but think that a little joint action on the part of Scientific Clubs interested in the Geography of so extensive a district, would find forcible expres-

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sion in the House of Commons, if represented by some active Member connected with the locality; and thus afford us some hope of seeing this great measure accomplished during our lifetime. The millions spent in war are usually the standing excuse for the denial of a few thousands devoted to this inestimable home boon, which would save in parish and road surveys, and estate maps, at least 25 per cent. every year upon its whole cost; let us hope that we may be heard upon this subject as soon as we have done civil-engineering for the Abyssinians.

There is one feature of a mournful character for which the past year has been remarkable which I cannot help naming to you, viz.: the extraordinary number of deaths of persons highly distinguished in science and literature: Sir Archibald Alison, Sir David Brewster, Dr. Daubeny, Michael Faraday, William Hamilton, John Hardman, Sir William Snow Harris, Valentine Knight, Sir William Lawrence, Sir John Lubbock, Professor de Morgan, the Earl of Rosse, Gideon Scott (C.E.), Sir George Smart, Sir Robert Smirke, Sir James South, Clarkson Stanfield, and Lord Wrottesley, are names all most familiar to our ears, of men whom we never again shall speak of as being amongst us. Besides these names of fellow countrymen, there are others with which we are almost equally familiar, Baron Marochetti, the distinguished Italian sculptor whose somewhat hard statuesquerie we men of Herefordshire gave precedence to, when our own illustrious Gibson was still living, and surrounded in his studio by a class of works which made you feel as if Greek art was not yet dead. I stood in that studio at Rome, the day after I had followed his remains to the Protestant Cemetery, and it was impossible not to feel a wish that we had had something of his to decorate our County Hall. The lovers of Photography will also recall the name of Antoine Claudet, the great successor and improver of Fox Talbot and Daguerre; and I must not omit that of Victor Cousin the great historian of philosophy.

This is indeed a mournful list, if there was any fear that the van of advancing science would suffer discouragement, or waver when its leaders were struck down. But the reverse is the truth; for, of which of these may it not be said that, though the individual be gone from us, the Name and the Works remain an imperishable and increasing power to light forward many on the same path. Indeed, if, on casting our eyes over the panorama of the present time, with its disastrous monetary and commercial state, its babel-like confusion-worse-confounded, of all political principle, the startling and scandalous revelations of a Trades Union Commission, the senseless atrocities of the Fenian conspiracy, and, I may almost add to this list, the morbid and depraved 'sensation'-ism that has tainted and enfeebled a large class of our literature,—if, on reviewing these features of the time, we should be led to indulge mournful or apprehensive reflections, I think that there is one reassuring sign of healthy progress existing, in the unmistakable and successful activity pervading the field of Physical Science. It is not enough to say that it has grown—it has

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rushed from dwarfish to gigantic dimensions with self-accelerative speed, almost within human memory. A glance over Sir C. Lyell's sketch of the progress of geology, in his great work, leaves one amazed at the childish absurdity of view, on the structure of the world and the facts of animal and vegetable life, entertained by men of ability but half a century ago. The changes that that period has witnessed have never been better described than in Lord Macaulay's summary of the fruits of inductive research applied to the facts of the physical world. "It has lengthened life, it has mitigated pain, it has extinguished diseases, it has increased the fertility of the soil, it has given new securities to the mariner, it has furnished new arms to the warrior, it has spanned great rivers and estuaries with bridges of forms unknown to our fathers, it has guided the thunderbolt innocuously from heaven to earth, it has lighted up the night with the splendour of the day, it has extended the range of the human vision, it has multiplied the power of the human muscles, it has accelerated motion, it has annihilated distance, it has facilitated intercourse, correspondence, all friendly offices, all dispatch of business; it has enabled man to descend to the depths of the sea, to soar into the air, to penetrate securely into the noxious recesses of the earth, to traverse the land in cars whirled along without horses, and the ocean in ships which run ten knots an hour against the wind." All this it had done when this impressive summary was penned five-and-twenty years ago. But how far does this fall short of what has since been accomplished! We have since seen it, by the investigation of the mysteries of light and colour, analyse the substance of the sun, and the more distant bodies of space; it has followed and mapped the course of the Tempest that sweeps over the ocean and the land; it has solved the ancient problem of the Sources of the Nile, and the modern one of the North West Passage. It has not only conveyed the lightning to the earth, but laid it beneath the ocean, to re-unite the kindred language of distant Hemispheres. If it has not yet destroyed the scourge of War, it has so revolutionized its practice, both naval and military, that already its worst feature, that of duration, is probably abridged for ever.

Surely such a change as this is enough to show that man is essentially the child of progress. Viewing his career, from the days of flint hatchets to those of ocean telegraphs, it would seem as if, except in the very roots of his moral and intellectual nature, he is a changed being. His conception of the whole universe around him is so totally different to that which was once entertained, that the forms of language and even the very structure of his thought, have to be modified. Not only has he bid farewell to the wonder, and terror, and mystery, and superstition, of ignorance, but even the Convulsions and Cataclysms of science have yielded to calmer and gentler views of the power and processes of nature; and the Present is seen stretching back by a harmonious unity of law into the vista of the Past.

To look into the Future is indeed not granted us; but where is the prophet who does not use the Past as the instrument by which to judge of the Future?

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ix.

That man cannot recede from the point he has attained is certain ; but not less sure is it that his future career will be, like his past, one of continued progress and transition. Beyond this, science is silent. But if there be philosophy as well as history in that past, if it have a soul of meaning as well as a mere body of factology, if upon the successive pages of human progress there is a heading which repeats itself in characters that grow clearer and more distinct, it is one that bids us look forward to that undisclosed future with confidence, and with hope.

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"ALL ARE BUT PARTS OF ONE STUPENDOUS WHOLE
WHOSE BODY NATURE IS, AND GOD THE SOUL."

Pope.

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THE REMARKABLE TREES

OF

HEREFORDSHIRE.

"THE EARDISLEY OAK," EARDISLEY COMMON.

(Quercus pedunculata.)

"A fine old tree," says Loudon in his Arboretum, "having an immense head. The trunk is 18ft. high, and 30ft. in girth at 3ft. from the ground; with a hole at the ground which in warm weather serves as a retreat for pigs and sheep." The exact measurements of the tree now (1867) are at ground level 62ft.; at 3ft. high, 34ft.; at 5ft. high, 28ft. 2in.; at 6ft. high, 26ft. 6in.: and at 10ft. high, 38ft. Its centre bough has a circumference of 19ft. The greatest height is 66ft., and the spread of foliage is about 90ft. Nine or ten of its chief boughs are now dead, and several have been cut off. The hole is nearly filled up with new wood.

Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.

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The Woolhope Naturalists' Field Club.

MEETING AT COLWALL FOR THE HEREFORDSHIRE BEACON.

TUESDAY, MAY 28TH, 1867.

They who think that a rainy day has power to "spoil the spirit" of an out-door gathering, should have enjoyed the opportunity of recasting their experience on Tuesday last, the day appointed for the first assemblage this year of the members of the Woolhope Club of Naturalists of this county, under the Presidency of Chandos Wren Hoskyns, Esq. To awake half an hour earlier than usual in the morning with the pleasant thought of a day's stroll over the breezy heights of the "Herefordshire Beacon," and then, on looking out of the window, to find that the sun had overslept himself, and is still rolled up in a wet blanket of dripping clouds, is damping at first—even to a philosopher's feelings—let Dr. Johnson say what he may about "weather" and "fools." But the prospective charm of that *dulce alloquium*, which finds "sermons in stones and good in everything," proved a counter-weight even to the heaviest horizon; and a fair sprinkling of the members had to congratulate each other and themselves on their courageous meeting at the rendezvous at Barr's Court Station, in time for the train which was to take them to the foot of the Malvern Hills.

Field-clubs are a comparatively modern form of association, and they who have had no experience of them can little imagine the allurement of those meetings, in which pleasure derives itself from the mere sympathy of one science with another, amid the incidents of a walk over a district suited to give birth to them. Pleasure is a coy creature, rather apt to fly illusively from those who pursue her for her own sake; but when you are busy looking for *something else*, she has a capricious way of coming up and taking you by the hand as tame as possible, and smiling so simply and innocently, that you almost wonder people don't get better to know her "tricks and her manners," and treat her as an adjective that only attends some substantive occupation or pursuit. The Field-clubs seem to have found her out; for whether you look

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back to them, or forward to them, there she is, without any special card of invitation, though of course always welcome; and perhaps this accounts for the rainy days affecting them so much less than they do pic-nics and archery meetings and croquet parties. Perhaps, too, geology, archæology, botany, and entomology, may seem dry subjects to some people, and a wetting occasionally may be useful to them, or anyway may be studied under meteorological variations.

The skies were questioned with some curiosity on the way, very naturally; and very naturally, at least for English skies, gave "evasive answers." Yet, at Colwall Station there was another "band of brothers" found, who, either because they were weather-wise, or because they were otherwise, had confidence in the day; and with this reinforcement,—numbering altogether nearly thirty hammers—(why should not geologists be counted by "hammers" as well as soldiers by "bayonets," or sportsmen by "guns?") —away the party started, determined upon a "fight for the Beacon," though the enemy was already encamped upon it, in a cloud that quite concealed the summit, evidently prepared to contest every inch of the ground.

To proceed, however, to report the proceedings in detail.

In addition to the President, Chandos Wren Hoskyns, Esq., the following gentlemen were also present—the vice-president, T. Curley, Esq., C.E.; Edwin Lees, Esq., F.L.S., &c., Worcester; Dr. Harvey B. Holl, F.G.S., &c.; J. E. Lee, Esq., Caerleon; Dr. McCullough, Abergavenny; Dr. Bull; John Lloyd, Esq., Huntington; the Rev. C. Griffith, Clyncelyn; Flavell Edmunds, Esq, Hereford; Thos. Cordes, Esq., Brynglas; the Rev. E. Du Buisson; the Rev. Thomas Phillipps; the Rev. John Raven; Rev. E. J. Owen; the Rev. J. H. Jukes; Henry Dumbleton, Esq., Treholford; the Rev. E. Dumbleton, Brecon; the Rev. R. Hereford; Dr. Wood; J. T. Owen Fowler, Esq.; Alfred Purchas, Esq., Ross; Mr. E. Bird; Mr. J. H. Pitt; Mr. P. Bayliss; and Mr. Arthur Thompson, assistant secretary.

Previous to the departure of the train from Hereford, the members held a meeting for ordinary business in the Superintendent's office at the Barr's Court Railway Station, the use of which had been kindly lent. The following gentlemen were unanimously elected annual members of the Club:—B. Haigh Allen, Esq., The Priory, Clifford; W. J. Bonnor, Esq., Hereford; F. Broughton, Esq., Manager of the Mid-Wales Railway, Brecon; James Davies, Esq., Hereford; Henry Dumbleton, Esq., Treholford, Crickhowell; J. T. Owen Fowler, Esq., Hereford; R. D. Harrison, Esq., Holmer Hall; Thos. Edmund Husbands, Esq., Shamrock Villa; Mr. John Lloyd, Kington; Rev. John Raven, Harewood; O. Shellard, Esq., Barton House.

At 9.45 the Club left Hereford by the Worcester train, and reached Colwall in due course at 10.28. The weather was at this time most unpleasant, dull gray sky with strong wind and driving rain. Umbrellas and Mackintoshes were the order of the day, and the one cheering thing was the mutual surprise of every one there to see so many others boldly braving the elements in pursuit

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THE REMARKABLE TREES
OF
HEREFORDSHIRE.

THE COLWALL OAKS *(Q. pedunculata).*

OCTOBER, 1867.

These picturesque trees, stand in a field still called "Colwall Park," which formed part of the demesne of a summer residence of the Bishops of Hereford. They are of great but not extraordinary size. The tree in the foreground, at five feet from the ground, where the card of the Club is placed (one foot by six inches in size), measures 16ft. 2in. in circumference, spreading out on the ground to a circumference of 34ft. The tree in the background is the largest. It measures at five feet 21ft. 7in., spreading out on the surface of the ground to 40ft. 10in.

This Photograph has been very kindly presented to the Club by Major Peyton, of the Bartons, Colwall.

(Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club)

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of science. The fine old church of Colwall—the "Colewelle" of Domesday Book—was the first point to which their steps were directed; and on the way those members who took interest in antiquarian questions conversed on the etymology of the name. It being generally agreed that the spelling of Domesday Book was the best guide to the etymology, it was concluded that the "well" which had given name to the places was probably one of the supposed holy wells or springs which were so important in the Saxon paganism, being supposed to be the abodes of minor deities. The worship of these deities seems to have survived for many ages, in spite of all attempts to extirpate it by penal law, although heavy penalties were denounced against *welweorthunga* (well-worship) as well as against other pagan usages. The first syllable of the word Colewelle was held to mean Cold, either from the open position of the well, or from the temperature of the water, as compared with that of St. Anne's well, which is probably the nearest holy well; but no well was observed which seemed likely to be the one from which the parish received its name.

On reaching the church, the archæological section of the party examined the restored chancel and the remains of the interesting old cross near the church, with its richly-carved tracery; and be it added that many a regretful thought was given to the sad reminiscences suggested by the poor deserted rectory close by.

From the churchyard the main body proceeded by a farm-house, whose great size, and heavily-timbered walls, and odd windows, give it an appearance of departed greatness, that bears out well the tradition of its having been formerly one of the summer palaces of the Bishops of Hereford—on through the farm-yard—on by the muddy remains of the fish-pond—on to the field that still has the name of Colwall Park. In the middle of this field stand the two celebrated Colwall oaks—alone in their glory,—the last remnants of the primeval forest of the district. They are very picturesque trees;—they still bear a considerable amount of foliage about their centres, but lift up through it their large stag-headed branches, bare and dead, towards the sky; they are of great, but not of extraordinary, size. The largest tree, at 5 feet from the ground, measures 21 feet 7 inches in circumference, but spreads out towards the ground to the circumference of no less than 40 feet 10 inches. This tree is hollow; and as five of the members stood up within it, it was evident that three more could also have done so at the same time. The companion tree, at 5 feet, measures 16 feet 2 inches, spreading out in a similar manner to the circumference of 34 feet on the ground. They are both *Quercus pedunculata*, the so-called old English oak. The very great appearance of age presented by these trees, their picturesque shape and solitary position, well backed as they are by the range of the Malvern Hills, gives them a most interesting character.

> "Three hundred years an oak expends in growth—
> Three hundred years in majesty stands forth;
> Three hundred years declines and wastes away:
> Then dies, and takes three hundred to decay."

So says the Iolo M.SS. in the "Ancients of the World." These trees are

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probably a thousand years old, and as the Club sheltered behind them from a drifting rain-storm, considerably heavier than a Scotch mist, it was impossible to escape the thought that in their day the noble encampment on the Herefordshire Beacon above them may have been a scene of life and action. When they were saplings, the Saxons had not yet overrun the country. And . . . if the rain had not happily ceased, there is no saying the length to which such old historical associations might have been carried. Happily the sky brightened, and under the guidance of Dr. Holl, the Club proceeded at once to the Barton Court quarry. Here there exists what geologists term "a fault" in the rocks, of a very interesting character. In a line running obliquely close by the quarry the rocks have been broken through, the lower rocks (across which the railway was made) were raised, and thus the Lower Red Marl strata at the quarry are in immediate conjunction with the Upper Ludlow rock by the railway; and the yellow beds of Downton Sandstone and the Fishbone beds of Ludlow have been cut out. The clay slate stone of the quarry is very rich in organic remains, and some time was spent in the search for them. Many characteristic fossils were found, and, as each member brought up his discoveries to be named, the scene was quite animated; now it was a *Rhynchonella nucula*—now a *Peronæa retroflexa*—one rejoiced in the possession of an *Orthonota amygdalena*, and another was happy in the discovery of *Serpulites longissimus*, besides which, portions of *Orthoceratites*—the *Conytes lata*, and several other interesting fossils were also found. The route was then taken for Chance's Pitch, the geologists speculating meanwhile as to the depth beneath their feet of the Downton Sandstone. This rock does not show at this portion of the hills, but there was no doubt, Dr. Holl stated, that it occupied its place on the slope of the hill. Above Chance's Pitch, on the turnpike-road, the lowest portion of the Upper Ludlow rock crops up, and a good specimen of *Rhynchonella Wilsoni* was soon obtained, with many other shells. Higher up the hill the Aymestrey Limestone appears, and here fragments of the *Pentamerus Knightii* were found with the *Orthoceras ibex* and many other shells.

The most interesting of the wild flowers observed were the *Potentilla verna*, the *Cistus Helianthemum* (yellow rock rose), the *Geranium lucidum*, *Ervum tetraspermum*, *Linaria cymbalaria*, *Myosotis versicolor*, *M. collina*, *Galium saxatile*, *Veronica montana*, *Lysimachia nemorum*, and *Aira præcox*. But in good sooth the vegetation was everywhere too wet to be very closely investigated.

The question (if there was any) of attacking the encampment was settled partly by seeing that the hostile clouds had entirely disappeared from it, and partly by seeing, with the unnecessary aid of a very excellent binocular produced expressly for the occasion, (that is of exhibiting itself) that some of the party had already climbed the hill.

The wind was found to be rather boisterous on the top, but all were were speedily gathered around the President on the leeward side of the Prætorium, or central enclosure, of the ancient camp.

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There are few scarped hill encampments in England that can be compared to the Herefordshire Beacon, and an impromptu description, most ably given by Mr. E. Lees, on the summit, was listened to with that critical zest, of alternate cheers and learned interpellations, which marks an acute audience without interrupting the able discourse of a highly illustrative narrator, diving into the fathomless depths of the past, and bringing up the pearl either of actual historical truth, or some mother o' pearl substitute of such persuasive bloom that every one took it for the same thing, or of equal value in its way.

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REMARKS ON THE HEREFORDSHIRE BEACON,

By EDWIN LEES, Esq., F.L.S., F.G.S., &c.

Mr. LEES commenced by saying that, next to stones of memorial, the earthworks of any country may justly be looked upon as permanent monuments of antiquity, and these indeed have subsisted after the proudest efforts of architecture have been laid low. No Roman buildings remain entire in this country, but the roads and camps of that warlike people still attest the skill and labour they applied to all their enterprises. Man has ever been a quarrelsome animal, and no doubt ditches and entrenchments were first formed as boundaries to possessions, and to prevent disputes; but when tribes became hostile to each other, and wars ensued, then it became necessary to raise regular defences, and this was done in the easiest manner by digging entrenchments and raising mounds of earth. In case of an invasion, these entrenchments were defended with the utmost obstinacy. King has remarked, in his "Munimenta Antiqua," that among the various castrametations in Britain there is not a stronger or more remarkable one than that on the Herefordshire Beacon. It defends the principal natural pass through the Malvern Hills, and from its situation and the labour that attended its construction, must evidently have been of a permanent character. And now I may say with Shakspere—

> Come, noble gentlemen,
> Let us survey the 'vantage of the ground.

This grand Castrametation extends rather more than half a mile from end to end, but is very irregular in its form, the vallum accommodating itself to the inequalities of the Beacon, and forming a double oval by its extending wings. It is about three hundred yards in width at the broadest part, and its whole circumference is 2970 yards. A single fossa and vallum encompasses the whole camp, the fossa being about 30 feet in width, but on the eastern side several terraces appear one above the other within the external vallum. In the centre and surrounding the summit of the beacon is an inner fort or prætorium, having a ditch from 12 to 18 feet deep, excavated out of the solid rock, and across this is a narrow neck southwards, forming the entrance, and sufficient only for the passage of a single person. The original entrance to the camp was from the south-west, by a very easy ascent, which communicated with a natural road, called to this day the Ridgeway. The extent and resources of this castrametation make it exceedingly probable that it was not constructed for temporary purposes, but intended for permanent occupation, like the hill fortresses of India. It has been calculated that an army of 20,000 men might easily be ranged and posted within these trenches, and there is besides area sufficient for the stowage and pasturage of horses, flocks of sheep, and store of cattle. Water is also close at hand on several sides. The question then arises, who were the people who constructed this extensive fortress, and on what particular occasion might it be considered probable that it was occupied and defended?

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Three hypotheses present themselves, with more or less probability, and all of them have been by turns selected by some writer or observer. Pretty generally the favourite suggestion has been that this is an ancient British fortification, constructed at or before the Roman invasion, and defended against the Roman power. A few archæologists have thought that the Romans themselves formed the camp, but as the acknowedged Roman camps are all more or less quadrangular, while the British ones take the natural though irregular form of the hill throughout all its undulations, there seems but little ground to suppose that the stern Romans planted their conquering eagles here. When the Archæological Association visited this spot a few years ago, the learned antiquary, Dr. Guest, of Cambridge, was asked his opinion about the camp, and he said it was certainly British, but he would not commit himself to any particular era. Other antiquaries have not been so cautious, and the late Dr. Card, Vicar of Great Malvern, wrote a "Dissertation on the Herefordshire Beacon," in which he attempted to prove that this camp was of British workmanship, and formed under the direction of the renowned Caractacus, a prince whose genius, patriotic valour, and misfortunes, have all combined to immortalize his name. So little is known of the history of the inhabitants of Britain before the Saxon sway in England was fully established under Alfred, that the few names that arise conspicuous out of a haze of mystery like rocks in a sea of vapour, have been eagerly seized upon to give a grace to local inquiries. As brave men lived before the time of Agamemnon, so there were, doubtless, warriors in Britain both before and after the date of Caractacus, though their names and actions have not had a Tacitus to record them, and we must admit the interest that attaches to the history of the Silurian Prince Caradoc or Caractacus, whether we believe with Bishop Horsley that he really stood here within these trenches or not. His noble bearing when taken prisoner by treachery, and led before the Emperor Claudius at Rome, is well known to every reader of history; and Mason, in his poem of Caractacus, has well drawn the intrepid though vanquished British chieftain. Claudius is said to have expressed his wonder at the boldness of his prisoner, and asked him how he could think of opposing the Roman dominion, to which Caractacus, as stated by Mason, fearlessly replied—

> Soldier, I had arms,
> Had neighing steeds to whirl my iron cars,
> Had wealth, dominion.—Dost thou wonder, Roman,
> That I sought to save them?

In what language this was spoken is not said. Claudius could not have understood it in British, but it might have been interpreted to him, but the description of Tacitus is alone sufficiently affecting when he said that while the other captives descended to abject supplication—"*At non Caractacus aut vultu demisso, aut verbis, misericordiam requirens, ubi tribunati adstitit in 'hunc modum locutus est,*" and naturally enough amidst the grandeur of Rome, Caractacus simply expressed astonishment that the Emperor should have envied him the possession of a humble cottage in Britain. But did the Silurian

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chieftain stand in arms before the Roman legions here on this Herefordshire Beacon? Dr. Card, who has in his dissertation on the subject warmly espoused this idea, thus expresses himself:—

"It was on this spot, now known by the name of the Herefordshire Beacon, that the lion of Britain, unweaned and roused from his native woods, before his sinews were knit, or the age of his strength was arrived, awaited for a time the Roman hunter in the zenith of his might, and burst through the toils set for him, preferring the prospect of destruction to the abasement of an ignominious safety. A place connected with these varied and interesting associations, clothed with every title that can ennoble, exalt, and endear it to the heart of a British patriot, cannot but be regarded with the deepest veneration, standing as a striking and imposing monument to record the heroism of those who were willing to die for their country's freedom."

But this is only fervid declamation and mere supposition. The facts of the case simply are, that more than a century after the invasion of Julius Cæsar, in the year 50 or 51, Ostorius Scapula, the Roman proprætor, who commanded in Britain, having conquered the Cangi and repressed a revolt of the Brigantes in Leicestershire, prepared to attack the Silures in the western part of the island, including Monmouthshire and Herefordshire. Had he advanced from Worcestershire, it may well be supposed that the camp on the Beacon here would be occupied against him, but it is acknowledged that he crossed the Severn at Aust Passage, and entered the heart of Siluria by the valley of the Wye. Thus the Herefordshire Beacon would be useless as a defensive point, and wherever the final conflict with the Romans took place, and several localities have been named, it was certainly not here. It is unquestionable that whoever held this fortress defended it against an enemy advancing from Worcestershire, and that enemy, I believe, was the fierce Saxon. Eight dreary centuries elapsed between the advent of the Roman Ostorius into Herefordshire and that of the Saxon King Athelstan, who finally conquered the county. After the Romans left Britain the *Walsh*, as they were called by the Saxons, the successors in fact of the old Silures, maintained themselves in Herefordshire long after the Saxons had established themselves in Mercia and Worcestershire. The Princes of North and South Wales were really powerful, and made a bold defence against the advance of the Saxons until the beginning of the 10th century. To them this camp was an important border fortress, and it was therefore by the *Britons or Walsh of the Saxon period*—between the years 400 and 800, that I conceive this great castrametation to have been made and maintained. They had an enemy advancing from the East, but the Silurian Britons had not. In the Anglo-Saxon Chronicle of Brut, as translated by Sir Frederick Madden, we read that the Saxons came to Malvern between 924 and 939. The Chronicle says that King Margadad then "dwelt near the Severne with very mickle folk," and it adds, "Athelstan to him advanced, the king of this nation—that is, Angle-land—and held them exceeding hard and greeted them with harm, and drove them with his weapons over the Wye, and took from them the land that lieth

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there betwixt the Severn and the Wye: they possessed it not afterwards." It is remarkable, too, that the only relic found about this camp should have been a golden coronet adorned with precious stones, which was dug up in 1650, in the garden of a cottage, at the outer edge of the intrenchment near the Wind's Point. This coronet passed from hand to hand, and the issue of it was that it was sold for about £2,500. Though the coronet was broken up and its value realized, the particulars given respecting it from a MS. in the library of Jesus College, Oxford, seem to place the finding of the ornament beyond any doubt. One Thomas Tailer, of Colwall, is said to have found it, and he parted with it for the inadequate sum of £37 to a jeweller of Gloucester, who again sold the crown to a London jeweller, in Lombard-street, who discovered its value. Now it is evident that no rude Silurian prince in pre-Roman times could have been the owner of such a coronet as that; but it is recorded in Caradoc's History of the Princes of Wales, that Roderic and his sons, who were Welsh princes, each wore on their helmets a coronet of gold inlaid with precious stones. This was in the 9th century, and it is therefore not improbable that a similar coronet may have been worn by Margadad in the following century. As the Britons were finally dispossessed of the district between Severn and Wye in his time, it is not improbable that he or some other prince of his race, in contending against the Saxons, lost his crown or his life on this spot, which was assuredly battle-ground, or lost or flung the crown away in his flight after being here defeated. I have therefore no hesitation in assigning the defence of this fortress to the Britons, though of course it is impossible to say the exact date when the trenches of this formidable work were made. The want of a historian or a poet is felt in every such case of doubtful designation. The magic pen of the writer raises the humblest name into the regions of fame and romance, while without its aid names and actions, however important and brilliant dissolve into airy nothing like the mists of morning on these hills. Still, there is much instruction to be derived from a contemplation of the mighty vallum and extensive trenches of this castrametation, though mystery so cloaks the actors in the dim arena that they cannot be personified with absolute certainty, and though learned archæologists may take antagonistic views. In the language of Sir Walter Scott, indeed, we are left to muse—

> Of ancient deeds so long forgot;
> Of feuds whose *memory* is *not*;
> Of manners long since chang'd and gone;
> Of chiefs who under their gray stone
> So long had slept, that fickle Fame
> Had blotted from her rolls their name,
> And twin'd round some new minion's head
> The fading wreath for which they bled.

The address was received with applause.

Mr. LEE, of Caerleon, gave a description of a very similar camp which he had visited at Clermont, in France, and exhibited a sketch made on the spot. In reference to the theories which had been put forth as to the camp,

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he would only say that, where there was neither history nor remains, the best that could be said was, to use the words of an old chronicler, that "it might be so, or it might not" (laughter and applause).

The PRESIDENT said that they had been greatly interested with Mr. Lees's admirable lecture, and he felt sure that he was expressing the sentiment of all when he said that he thought they ought not to wait for the usual time of acknowledging the merits of that elegant address, viz., in the after-dinner proceedings (hear, hear). He would venture, then, to express the best thanks of the members to Mr. Lees for his address (applause).

Mr. LEES, in acknowledging the compliment, said that he was at all times ready to render any assistance in his power to the members of the club, in the prosecution of their studies and explorations.

The members then walked round the camp, Mr. Lees pointing out the single entrance, so narrow that only one man could pass at a time, to the prætorium or citadel, and the long easy ascent on the west, leading up from the Ridgeway, whereas on the east the only approach is up the steep face of the hill and the outer embankment of the camp. The general opinion concurred with Mr. Lees in the conclusion that the works were too great to have been executed by a petty chieftain in the ante-Roman times, but that they indicated rather the large resources of a powerful prince, reigning over a numerous and somewhat wealthy people.

The party then descended the hill, and made their way along the beautiful drive of the Ridgeway, a natural ridge of Wenlock limestone, of which advantage had been taken by the Britons to make a convenient approach to the hill. Here the botanists were delighted with the many beautiful trees of arbutus, mespilus (in full blossom), cedrus, pinus, and taxus, the last especially by their number, luxuriance, and position beside the old British way, suggesting that they were at least descendants of yews planted by the Druids along their *via sacra*. The principal object of interest, however, was the MISTLETOE OAK, one of the two oak trees in Herefordshire, and one of only seven in all England, on which the mistletoe grows. A real live mistletoe oak is indeed an object of much rarety and deep interest. The feeling of all present seemed to culminate to a state of semi-druidical heat and inspiration Any one would have supposed that some form of Pagan ceremonial was in contemplation, as the whole party alighted from their vehicles, and in various venerative attitudes clustered around the tree with uplifted eyes. Had it been the 29th instead of 28th, King Charles the Second would not have failed to come to mind.

A passing shower, however, soon drove every one to the carriages, which drew up at the Feathers Hotel, at Ledbury, exactly at the time fixed for dinner, viz., 4 p.m. The host had done his duty in this matter, and the Naturalists did theirs in justice to his excellent provision with much satisfaction. At these meetings, however, very little time is allowed for social enjoyment, and immediately after dinner,

The PRESIDENT rose and said that it was a great satisfaction to him to see

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such an excellent attendance of members at this meeting—with such a depressing morning nothing but a love of natural science could bring so many men into the field. They had, however, been more fortunate than could have been expected; the rain had kept off sufficiently to enable them to accomplish the day's programme, and he only hoped they had all enjoyed themselves as much as he had done.

Though a long time had elapsed since the club met they had not been idle. On paying a visit to the Mistletoe oak of Tedstone Delamere, it was found to be closely threatened by ivy growing up the tree and was overcrowded with other trees. He wrote to Mr. Bickerton Evans, of Whitbourne Hall, the proprietor of the tree, and received from him a very kind letter, stating that the ivy should be immediately cut from it and the tree properly cared for. Mr. Hoskyns then read Mr. Evans' letter, and certain matters of business were then alluded to, after which

Dr. BULL exhibited to the club an interesting series of shells, which had been very kindly sent to him by Mr. Lee, of Caerleon, and which seem to bear closely on the great question of the day, the transmutation of species. They were shells of *Volvata multiformis*, from the fresh water formation of Steinheim, in the Mayence basin; we should call it the Middle Tertiary, or Miocene, but Professor Quenstedt, of Tubingen, speaks of it as "the second mammalian formation." In his learned work, "Handbuch der Petrifaktenkunde," p. 982, he describes the formation and its shells, and avails himself of the careful investigations on the subject, which a certain Dr. Hilgendorf has made. These shells of *Volvata multiformis* present every variety in shape from the flat "planorbiform" to the spiral "trochiform." Amongst them three leading varieties are chiefly recognised as well as the several intermediate ones. A copy of the wood-cut in Professor Quenstedt's work (plate 86) was handed round, showing the series in regular gradation. The most "trochiform" variety is the latest in time, and the most developed. Amongst these, says the Professor, there is scarcely a flat planorbiform specimen to be found. Some fresh water American shells have forms very similar to these.

The President then called upon Mr. Flavell Edmunds to read his promised paper

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ON THE VARIATIONS OF THE PRIMULÆ,

By FLAVELL EDMUNDS, Esq., Hon. Member of the Woolhope Naturalists' Field Club.

The common species or varieties of the Primulæ—the "rathe primrose," the "yellow cowslip," and the "oxlip"—have long been favourites with all classes of observers. In the middle ages, as now, the poet's eye was caught by their beauty and their abundance, and he ever loved to embalm them in his song, the accuracy of his descriptions often showing a closeness of observation which cannot be surpassed. Chaucer sings of the "prime-rose" and "the sweet cowes-lippe"; Gawain Douglas mentions, among the delights of a morning in May, the

> Fresh primrose and the purpoure violet;

while in Shakspere the allusions to the primrose and the cowslip are almost as numerous as the flowers themselves are in nature at this season of the year. In the Winter's Tale (act iv. scene 3) he compares maidens who die young to

> Pale primroses that die unmarried
> Ere they can behold bright Phœbus in his strength;

In 2 Henry VI. (iii. 2) he describes people who "look pale as primrose with blood-drinking sighs"—an evidence that the varieties of colour to which I shall afterwards refer had not escaped Shakspere's eye. In Cymbeline (iv. 2) the fair Fidele is promised,

> Thou shalt not lack the flower that's like thy face,
> Pale primrose.

And when we read (in "Macbeth") of "the primrose way," or "the primrose path of dalliance," we have at once brought up before the mind the wood path "embroidered" with primroses and violets, along which youths and maidens are still as fond of straying as they were in Shakspere's days.

Shakspere's only reference to the Oxlip is in that exquisite passage (in the "Midsummer Night's Dream") where Oberon is describing the couch of his queen Titania:

> I know a bank whereon the wild thyme blows,
> Where oxlips and the nodding violet grows.

We must of course take Shakspere's word that he found these plants all growing together; but nowadays I suspect there would be some trouble to meet with a similar case. Violets and wild thyme may readily be found on the sunny bank, as at Breinton, for instance, but the Oxlip prefers the shelter of a wood.

The references in our great bard's works to the Cowslip are numerous, and indicate a closer and more accurate knowledge than he possessed of the Oxlip. He finds for his delicate Ariel ("Tempest," v. 2) as delicate a chamber:

> In the cowslip's bell I lie.

The Fairy Queen is said to have these sweet flowers in especial favour (Mid.

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N. Dream. ii. 1), and Shakspere's reference shows that the orange spots in the corolla had caught his eye:

> The cowslips tall her pensioners be:
> In their gold coats spots you see.
> These be rubies, fairy favours.
> In those freckles live their savours.

And Ariel can find no further adornment possible save the dewdrop, which he hangs as "a pearl, in every cowslip's ear." In the speech of *Burgundy*, contrasting the effects of peace and war (King Henry V. v. 2), the "freckled cowslip" is mentioned along with burnet and sweet clover, as forming the pasturage of the "even mead."

Milton records as the choicest gifts which "the flowery May" throws from "her green lap,"

> The yellow cowslip and the pale primrose.

In our own days, Wordsworth has used the primrose as the main element in his famous picture of the dull unpoetical practical man:

> The primrose by the river's brim
> A yellow primrose is to him,
> And it is nothing more.

To every poetical mind, the primrose is, no doubt, a great deal "more" than a mere flower; and we all gladly listen to the great truths of which it and other flowers are the symbols and the teachers, yet even to him to whom the primrose is "nothing more" than a flower, it needs not to be an uninteresting thing. But for its commonness, the glorious profusion with which it is poured forth on every sunny hedge-bank, by every tiny stream, in every by-path of our woods, helping with the violet to fill the sunny glades with a flood of delicate fragrance, it would be accounted one of the most interesting as it is one of the earliest of our many wildflowers. In its structure, it is as remarkable as an example of the wonderful adaptation of organs to their destined purpose, as any flower which the Spring or the Summer yields; and even the learned, accustomed to seek for rare things, may find much worthy of notice in this, one of the commonest.

The names of the three kinds of Primula which are best known are Saxon, thus showing that the plants, if ever introduced, were brought into England earlier than the Norman Conquest. The Primrose was anciently the *prime* (or early) *rose*, the name of the queen of flowers being applied loosely to almost any beautiful flower. The Cowslips, anciently Cowes' lippes, were evidently so called on account of their pure fragrance. The "Giant Cowslip" seems to have been called Ox lip in order to indicate its superiority in size to the Cowslip, much in the spirit in which the ancient Greeks prefixed the word for a bull to other words in order to indicate superior bulk, and we modern English speak of the bull-frog or the bull-rush.

In advancing to a consideration of the various kinds of Primula, their fragrance is the first peculiarity which strikes us. Whether Shakspere be right in supposing that "the savour" of the Cowslip lives in its "freckles,"

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i.e. in the spots upon the corolla, we know not, but certainly the corolla is the only fragrant part of the plant all through the genus Primula.

The wealth of perfume in this genus is indeed a fact which yet needs to be explained. For two or three months, a single plant will produce flowers which, without any cessation, will continue to give off sufficient odour to scent the air for some distance round; and single flowers, when gathered, if kept in water, or even if placed in a closed box, will continue for weeks to give out perfume. That this is an actual emanation of particles, and not a mere agitation of the waves of air, the perfumer proves by extracting the essential oil from the flowers, and thus retaining the perfume long after the flowers are destroyed or faded. Yet we find no reservoir of perfume in the primrose any more than in any other flower; we can detect no perfume in the earth out of which it grows, nor trace the chymistry by which the essential oil is elaborated out of the sunlight, the wind, the rain, and the soil, which seem to be the only materials with which the plant works. The flower in all its parts is but a developed leaf, yet neither the undeveloped leaves among which it grows, the scape which supports it, nor the root from which it springs, yields the perfume. It is in the flower only that it resides, and there we cannot detect its abode by the eye, however aided by art. The sense of smell is the only power by which we can ascertain its presence. Yet it is so abundant that the evening breeze is laden with it, although it has freighted every current of air which has passed the flower since sunrise. Here is a mystery which I commend to the notice of the very wise people who will not believe anything which they cannot understand.

When we come to consider the varieties of the Primula, it will be found that we have to unlearn something which we have been taught. As a character of the two commonest species (*P. vulgaris* and *P. veris*) Hooker and Arnot say, "tube of the corolla with a circle of scale-like folds at the slightly contracted mouth." In regard to the existence of the folds, there is no question, but the accuracy of the expression "scale-like" may be doubted as far as this district is concerned. I have examined a great number of specimens, in this and preceding years, and have been quite unable to discover one in which the folds have any resemblance to scales. To my eye they are obviously folds, not very strongly marked, present in all the intermediate forms between *P. vulgaris* and *P. veris*, but in none assuming the appearance of those appendages to leaves which we find in many plants, and which are generally understood by the term "scales." In the Primulæ the folds are mere puckerings of the membrane of the corolla, having concavities at the back, and being unmarked by any thickening of the membrane or any projection or appendage.

Hooker conforms to custom so far as to rank *P. vulgaris*, *P. elatior*, and *P. veris* as species, but he adds a protest against their being so considered. Other botanists give us *P. grandiflora*, *P. acaulis*, and *P. intermedia*; which Hooker unites with *vulgaris*. He adds a doubt whether *P. elatior* is really

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distinct from the numerous hybrids between *vulgaris* and *veris;* and my own observation leads me not only to echo that doubt, but to question whether all the six, and the hybrids too, ought not to be accounted varieties of a single species. The points of distinction on which the species are founded are so unsatisfactory, whether we take leaf, hairiness, inflation of calyx, or folds of corolla, and the cases of variation are so numerous, that I cannot regard the characters as sufficient to justify the division. The openness or concavity of the mouth of the corolla, for example, which Hooker gives as the mark of *P. elatior*, varies so much that it is impossible to be sure when one has got a specimen which bears out the description, since even flowers on the same plant vary; while on all the other points of structure there are many intermediate forms.

To this remark, however, there is an apparent exception. *P. veris* and the intermediate forms between it and *P. elatior* seem always to have glaucous green leaves and scapes, while *P. vulgaris* has those parts of darker green. This seems to be due to the fact that the hairs on the surface of the latter are scattered, and of unequal length, while on the former they are all short, equal or nearly so, and closely set together, giving the appearance called tomentose or woolly.

The character founded on the shape of the leaf is certainly not to be depended on, as it varies in the same plant at different stages of its growth. *P. vulgaris* has usually leaves which taper from the middle both ways, whereas the common form of the leaves of *P. veris* and *P. elatior* is oblong ovate; but I have met with leaves of *P. vulgaris* which were "contracted downward" only, and leaves of the other two varieties which tapered slightly from the middle of the leaf upward.

The intermediate forms, between the Primrose and the Oxlip on the one hand, and between the Oxlip and the Cowslip on the other, occur so frequently as to convince me that they are mere stages in the progress of the plant. Taking the term *elatior* as describing the common form of the Oxlip, of which several specimens are before you, I would arrange the so-called species in a pyramid thus:—

Primula elatior.

Wild Polyanthus. P. auricula.

Primrose Oxlip. Cowslip Oxlip.

Coloured Primrose. Intermediate forms.

Primula vulgaris. Primula veris.

On this theory, bearing in mind that the flowers of *P. vulgaris* will be found to spring from one point, and therefore to constitute what Hooker and Arnot style a "sessile umbel," I suggest that the variations may be thus accounted for. In rich soil and sheltered positions, the plant begins to advance,

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by producing flowers in which various shades of pink and purple take the place, first partly and afterwards wholly, of the normal yellow. If the soil do not contain the carbon and oxides of iron necessary to produce the change of colour, it may yet be rich enough in the materials out of which the plant produces structure and yellow flowers; and in such case the advance is made in the direction of structural development. In place of producing a sessile umbel, the plant raises the umbel upon a short scape or stalk, less than half an inch long in some specimens. The flowers at the same time grow deeper-hued; while the hairs upon the leaves and other parts of the plant grow more numerous, and the inequality in this length, which characterised *P. vulgaris*, is less marked. In succeeding generations, if the richness of the soil continue, these changes go on until the scape is about three inches in length, the flower stalks having lost part of their length. This stage I recognise as the Primrose Oxlip. The process continues; the scape lengthening, the hairs becoming more equal, the corolla acquiring an orange tint about the throat or entrance of the tube, and the calyx—no longer hollow between the midribs—showing a more or less inflated membrane. We then have what may be called the wild Polyanthus stage. The garden Polyanthus I take to be the same stage reached by cultivation. The process of developement goes on; the scape becoming larger, while the flower stalks continue equal, and the flowers are almost as large as these of *P. vulgaris*; the beautiful orange tint of the corolla settling down in dense spots on the folds around the opening of the tube; and the whole plant becoming lighter in hue from the tomentose state of the hairs. This is the apex of the pyramid of growth—the perfect form of the flower—the Oxlip.

The Auricula comes in here. Although maroon, deep purple, or brown with us, in its native state on the Swiss Alps its corolla is yellow, like that of all other forms of Primula in a natural state. The darker hues with which it appears in our gardens and greenhouses are the result of rich manure applied for the purpose, that is, of an excessive amount of carbon.

Supposing cultivation not to intervene, and the seed to fall into soil less rich than that which nourished the parent plant, the process of degradation begins. Florists know the difficulty there is in keeping up artificially developed plants to any desired standard either of colour or form. In its native habitat, the Auricula is sometimes found white, probably from a failure of carbon in the soil. In this country, the Oxlip does not lose colour but declines in structure. The length of the flower-stalks becomes irregular, and the beautiful open umbel is converted into a cyme, in which one or two flowers stand out prominently, Oxlips amid a group of flowers that are almost Cowslips. A change in the condition and length of the hairs goes on *passibus equis:* they become softer and shorter. We have now the Cowslip Oxlip. In subsequent stages of the process these changes are carried further, the cyme of flowers becoming more compact, owing to the shortening of the flower-stalks, until we have a more or less dense head of flowers, making up by the number of its blooms—in favourable circumstances—for their small size as compared with those of the

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Oxlip, but retaining the orange spots around the throat of the corolla-tube. This great increase in the number of flowers borne by each plant, I take to be a proof that the species is approaching the lowest limit of its development: just as the human race is most prolific in poverty, and as those races of animals which are most easily destroyed are most fecund—nature making greater efforts as it approaches the danger of extinction. This plant with the large head of richly fragrant flowers is the Cowslip in perfection. The plant seems soon to exhaust the soil of its habitat; and if it stay, or if the wind carry its seed out of the wood or away from the rich sheltered hedgebank into the poorer soil and colder situation of the open meadow, the flowers speedily degenerate in number, and in place of a head of twenty or thirty blooms we have a poor starved plant with two flowers, or even with one. The fields adjoining the western edge of Acornbury wood, on the roadside going to Ross, occur to my memory as one among many places full of specimens of this state of the Primula.

Experiment, as far as I have pursued it, bears out my theory. I have transplanted some very fine Oxlips from the rich vegetable soil of a wood on clay subsoil to the comparatively poor soil of a cold open spot, and have found them degenerate just in the way in which I have stated. I have not yet tried the experiment in the reverse way, but the case of the garden Polyanthus seems to be just an artificial case of the advance which my theory supposes to occur from natural causes. I have always understood that the way to "improve" that favourite "florist's flower" is enrich the soil with strong manures. The colour of the flowers, for example, I have been told may be darkened very much by the application of street-scrapings in towns to the roots of the plant.

This remark suggests the whole subject of the colours of the flowers of Primulæ, which vary greatly. This season I have had Primroses, all wild, varying in colour from a dead white through pale and deep pink, lavender, and purple of various shades. The natural yellow of the corolla is probably due to alumina, since I find transplanted Primulæ in the less clayey soil of a garden lose colour; while the pink—called by Linnæus *incarnatus*, or flesh-hued—is attributed to the action of oxygen upon the grains of chromule, the green colouring matter of the plants; and the lavender and purple show the combined action in various proportions of oxygen and carbon, the darker hue resulting from the predominance of the latter substance. In all cases when leaves expand, the grains of chromule are surrounded by a thin film of gluten, which is chiefly composed of nitrogen; and the changes of colour in plants are due to the contest which goes on between the oxygen of the atmosphere and these two elements, the carbon of the chromule and the nitrogen of the gluten.

The specimen of wild Polyanthus on the table, which is remarkable at once for its resemblance in form and its difference in hue to the Oxlip, was gathered for me by Dr. Bull on the estate of our esteemed President at Harewood. I understood that he obtained it, along with specimens of Primroses of various abnormal hues, from the immediate neighbourhood of the old house of the Knights Templars; and that fact at once reminded me that the first purple

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primroses which I ever found were growing near Acornbury Church, in a spot which was once the garden of the ancient "House of Nunnes" at Acornbury. I learn from Mr. Martin, another of the active botanists of the club, that he has found similar coloured primroses near Goodrich Castle. I know that they also grow near Stretton Sugwas Church, as well as near Upper Bullingham Church. Thus far, the facts seem to suggest that these flowers are descended from specimens in the gardens of the mediæval castles, hermitages, and nunneries, and that they mark the sites of those gardens. A parallel case is afforded by the presence of *Saponaria officinalis* in the immediate neighbourhood of the site of the Monastery of the Grayfriars, at the Barton, and in no other spot near Hereford. The building, like the friars who inhabited it, has long since disappeared, and its site is a pasture field; but it is interesting to find one of the species of plants which they cultivated still annually recalling the memory of the cowled brethren and their "garden of herbs."

I have already noticed the Auricula as apparently the next stage from the Oxlip. It has, too, on the other side an affinity to the Cowslip. That flower has in some cases a mealy appearance, although I cannot learn that any instance has been found in which the mealiness comes off as in the Auricula, and I believe it, therefore, to be in the Cowslip a mere appearance, arising from the exceeding shortness, whiteness, and closeness of the hairs which grow so profusely upon all parts of the plant which are above ground. I understand the *P. farinosa* of some botanists to be founded on this appearance. A peculiarity of growth, which I have not observed noticed in any botanical work, is interesting from the frequency with which it recurs in all the varieties of Primula. Being a corolliflioral exogen, the Primula always produces its stamens from the walls of the corolla tube, but not always from the same part of it. At first, the anthers make their appearance not quite half-way up the tube. When the flower grows normally, the filaments quickly lengthen, although they do not stand out from the substance of the membrane until the anthers reach the mouth of the tube. They then bend over towards each other, meeting in the middle, the valves open, and the pollen is discharged upon the stigma which is just beneath, and the fertilising process goes on in the usual way. Frequently, however, I have found —in all the varieties of the Primula—cases in which the anthers remain in their first position, below the middle of the tube, while the style, having gone on growing naturally, has reached its usual height, and the stigma is thus far above the anthers which were intended to fertilise it. No doubt in many cases the long proboscis of the bee, or the body of the fly, in search of honey, makes up for the defect in the growth of the stamens. In leaving the flower, or in withdrawing his proboscis laden with honey, the insect may disturb the anthers, and then in passing out through the narrow mouth of the corolla he may brush off the pollen grains upon the stigma over which he passes. I suspect, however, that most of the defective flowers do not get fertilised at all.

The fact that flowers defective in this way frequently occur is, I am told, well known to florists. The Polyanthus and the Auricula are recognised as

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liable to this defect, which disqualifies plants for competition in flower shows; and the florists have invented a name for the defective flowers. The stigma resembling in size and shape the head of a pin, and in the defective state being the only object visible in the centre of the corolla, the flowers are known as "pin-headed."

I have observed that this pin-headed state occurs most frequently in single flowers of *P. vulgaris*, the remaining flowers of the same umbel being perfect. In the specimens on the wall you will see that it is found in the coloured as well as the ordinary states of the flower. In the more advanced stages, I have found the whole of the umbel in the same state, i.e., all the flowers on the scape having the stamens full grown or else all being abortive. It is most frequent of all in the Cowslip, and that fact goes, I think, some way to justify my theory of that flower being the result of the declining energy of the species. The failure of the stamens to reach their normal length seems to suggest a failure of vital energy. The precise cause of this failure I have not been able to discover, but its frequent recurrence shows plainly that it is a case of the working of some general law, which is either unknown or not suspected to bear on such cases. I shall, therefore, be grateful for any facts from the experience of other observers, which may tend to clear up the mystery.

The paper was illustrated by a number of dried and pressed specimens, all mounted on paper, which Mr. Edmunds affixed to the wall of the dining-room. The first set consisted of specimens of *P. vulgaris*, with yellow, and the same with dark purple flowers; of wild polyanthus; of *P. elatior* (oxlip); of various intermediate forms, and of *P. veris*. The next set consisted of specimens of *P. vulgaris* with sessile umbel of flowers, and with the umbel elevated in various degrees, showing the rudiments of a scape. The third set illustrated the abortive development explained in the paper, and consisted of specimens of *P. vulgaris*, *P. elatior*, and *P. veris* with stamens abortive, and other specimens in which they had reached the normal position. Mr. Edmunds explained that he had gathered and prepared all the specimens as illustrations of the paper.

Mr. FOWLER remarked that he had found the dark-coloured primroses growing near Dymock.

Dr. HOLL expressed his agreement with Mr. Edmunds as to the various forms of Primula forming really but one species.

Several other members also intimated their concurrence.

Mr. LEES said that it seemed to be always expected by the members that when he and his friend Mr. Edmunds met, there would be a difference of pinion; and indeed it had so happened on former occasions—(a laugh)—when there was a much greater diversity between them than at present. He had felt greatly interested with Mr. Edmunds' paper, which he thought a most ingenious one. He felt much obliged to him for his facts, although he felt bound to add that he utterly rejected his theory (laughter). He could not for a moment

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consent to regard the magnificent cowslip as a degraded state of the plant, the last stage on the progress towards extinction. He quite agreed with Mr. Edmunds in believing that all the three forms were mere variations of one species, but he disputed his theory of a progress from *P. vulgaris* to *elatior* and *veris*. Mr. Edmunds had laid much stress on the appearance of a rudimentary scape in *P. vulgaris*, but he (Mr. Lees) knew of instances in which the umbel, supported on a stalk, and single flowers, had appeared together on the same plant. Then, too, he could not accept the instances of abortive development as proving the gradual decay of vital power in the plant which Mr. Edmunds had deduced from it. He thought that all the various forms were but accidental variations; and he recommended Mr. Edmunds to pursue his experiments. He had known instances in which the seed of a cowslip on being sown had produced not only cowslips, but oxlips and primroses also, and he had known the seed of *P. vulgaris* in like manner produce the other forms of the plant.

Dr. BULL said he had often sown polyanthus seed and obtained every variety from the primrose-oxlip to the cowslip, but he had never once obtained a primrose itself.

Mr. EDMUNDS felt obliged to Mr. Lees for his criticism, which he felt to be in its main propositions a confirmation of his own theory. He, too, had read of the occurrence of the stalked umbel and the single flower in the Primrose, but happened to forget it, or he should have quoted it among the other proofs of the identity of *P. vulgaris* and *P. elatior*. He thought it was also a very strong proof of the progress of the plant. So again with the cases given of the productions of various kinds from the seed of one plant: if that could be established, it would place beyond doubt his theory that all the so-called species were really but one, while it would leave his theory of the progress of the plant unaffected. He put it forward only as a theory, but he understood a theory to be a guess at truth. As he was a seeker for truth, and knew no other mode of obtaining it but by guesses founded upon careful consideration of the facts, he could not help himself—he felt he had no choice but to theorise (applause).

The PRESIDENT expressed the great interest he had felt in the paper and in the discussion which had followed it. He only regretted that they had not more time to devote to the discussion, but he hoped that there would be an opportunity for a renewal of it at the next or some future meeting (hear, hear). At present the time for the departure of the trains was rapidly approaching, and he could do no more than briefly say that the members all felt greatly indebted to Mr. Edmunds for his most able and interesting paper, and also to Mr. Lees for his criticisms upon it (laughter and applause).

Thus ended the proceedings of an agreeable and profitable day, that will leave a characteristic memory of English climate, English perseverance, English scenery, and English country sociality.

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The Woolhope Naturalists' Field Club.

MEETING AT LLANDRINDOD,

JUNE 28TH, 1867.

On Friday, the Woolhope Club paid a visit to Llandrindod. The morning was dull and overhanging and a shower of rain fell here and there. The barometer, however, was too high to expect much rain, and there was a full attendance of members.

The Club met at the Barton station and elected the following gentlemen as new members:—J. H. Arkwright, Esq., Hampton Court; the Rev. E. J. Owen, Tretire; the Rev. Edw. Palin, Linton; Mr. James Pitt, Freetown; and the Rev. W. P. S. Stanhope, Holm Lacey; and, having transacted the ordinary business, set off by the 9.45 train, receiving an accession to their ranks at nearly every station. By the kind co-operation of Messrs. Henshaw, Broughton, and Bishop, the managers of the several lines of railway, they were enabled to reach Llandrindod by mid-day.

Leaving the train to make its journey, we will take the opportunity of saying a few words about that pride of Herefordshire, aye, of England, the fair river Wye, and her salmon produce and prospects. Who does not call to mind old Michael Drayton's picture of the wood nymphs, rushing forth in haste with uncombed locks, to see the wedding between the lovely Lug and princely Wye; and whether we read the pages of Ireland, Gilpin, Roscoe, or even more modern writers, we find everywhere a tribute paid to its exceeding beauty! Shall we be dumb in its praise? The spirit of the age, seeking to make all rivers pure and untainted by pollution, unfettered by mill-weirs, and productive of a vast supply of fish, bids us take a notice of it we have never done before; and is it not a labour of love, as well as a duty, that we owe it? The mountains, with their iron rocks, the kings of the universe, and the lovely valleys lying at their feet, have long been our study; but do we not owe a great deal of this formation of mountain and valley to the action of rivers? Those deep ravines formed by floods, where the strata of the rocks, denuded of covering, are laid

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bare, are most interesting to the geologist, as the valleys are with their rich treasures of plants, to the botanist; and many of the valleys were, in the earliest ages, one succession of lakes, now drained by the water wearing away the barriers at the lower end. Our rivers are older than our valleys, and co-exist with the rocks themselves.

Far off, on vast Plinlimmon, near the borders of Cardiganshire and Montgomeryshire, the Wye derives its source; four sister rivers, the Severn, Rheidol, Llyfnant, and Dulas also take their rise on that extensive range of hills, and hence a very pretty legend, which we cannot stay to record. Away the Gwy or Wye flies in hot haste from her mother's lap, and soon joined by the Tarenig and Bidno hurries past Llangurig,—anon it receives the Marteg, and still hastening on in its time-worn channel over the Lower Llandovery rocks, rushes down the cataract at Rhayader Gwy, or the fall of the stream.

The valley now expands, and on the right the Elan, swollen by the tributary streams of the Claerwen and Claerdu, pays its goodly tribute to the sovereign stream; the vale of the Elan is for some distance very wide, and then it becomes narrow and contracted, but sweetly pretty. From this point the Wye divides Breconshire and Radnorshire, and now grown into a goodly stream flows with rapid steps to Newbridge; here it receives the Ithon, that grayish white river, the bane of all salmon fishers on the lower water. We must here deviate from the onward course of the Wye, and turn up this brook, as the scene of to-day's excursion is upon it.

The Ithon is one of the largest tributaries the Wye has, and from its source on Kerry-hill to its junction, flows thirty-one miles; it receives in that long course some very pretty tributaries, the Aran, Clywedog, and Dulas, all of which the salmon, the king of fishes, frequents in the winter months in great numbers for breeding purposes. Here it was, about two miles above Llandrindod, near the junction of the Dulas, that that memorable affray took place last December; the flashing torch, the glancing spear, and the blackened faces of the poachers on the one hand, and on the other the water-bailiffs, were all there, and the night was one of pitchy darkness; the only thing wanting to complete the picture was, that the water-bailiffs, as Scrope says, should rush into the attack. That was there too, and a long and anxious struggle took place, blow for blow, until at length the water-bailiffs won the victory, the poachers were defeated, and four of their number taken. We were informed during our visit, that there is still much ill-feeling prevalent in that district against the salmon fishery laws, many persons of the better classes siding with, rather than against the destroyers of the breeding salmon, through the belief that the upper proprietors are unjustly treated, and are prevented getting their fair share of fish in the proper season. This should not be so, and as we have lately seen new and wise fishery laws passed, giving a much better chance to the upper proprietors than they ever had before, by the removal of fixed engines, a weekly close time for nets, and the prohibition of all fishing by nets after the first of September—all which regulations are very much in their favour—we may hope

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now for a better spirit to prevail. We have heard from more than one member of the Board of Conservators that there is every disposition on their part to act in the fairest and most liberal manner to the upper proprietors, and on the other hand it is fair to expect that they, the upper proprietors, will assist all they can in protecting the breeding fish; by this course of action, and by this mutual co-operation we may hope to see our river stocked again with fish, as it was in days of yore. During our stay at Llandrindod we heard of four fine salmon being taken this month at a single draught from a pool in the Ithon close by, and surely if a few fish can find their way there now, large numbers will by and bye, when the Wye itself improves. Give the scheme a fair trial, and do not condemn or endeavour to defeat it all you can without this trial. Let the waters bring forth abundantly. For the credit of Radnorshire, and of the character of the Welsh, who have long been considered a peaceable, and orderly people, let them obey the laws framed for the general good, and for their own good too, and no more let that peaceful valley, smiling as it does in the warm summer sunshine, witness again such murderous affrays.

Farther down, the Wye rushes through the gorge below the castle of Llechryd; this gorge is called the Rocks, and one of our party sees a salmon rolling in his silvery sweep in one of those deep pools between the rocks; but the water is too low to think of salmon fishing. The river is now flowing over the strata of the Upper Llandovery rocks; here the productive Irfon, a tributary of large size, flowing from the Abergwessin mountain and by the sulphur springs at Llanwrtyd, joins the Wye; and now swollen to the size of a large river, our fair companion rushes past the town of Builth (the Bullæum of the Romans). Anon, the river still flows wildly on in its rock-bound channel, now past Sir J. Bailey's fishing cottage, then by the Nydd and its far-famed salmon catch of Cavan Shwn Lewis, where it is said Mr. Charles Stretton killed twelve fish in one day; past the Skreen fishery at Erwood,

Here it lies darkling,
There it flies sparkling,
Now 'neath the shade of the oak it will lie—
Then darts into sunshine—this gay river Wye!

Now by Llangoed Castle, where you see from the railway the very pool where poor Mr. Holmes was drowned while fishing, in sight of his newly married wife. Ere this the Edw and Bachowy, or the little rapid river, tumbling over the precipitous fall of Craig-y-pwll-ddu, have added their waters to the larger stream. The Llanstephan rocks also show their lichen-covered heights, and, at Boughrood, sweeping round the large horse-shoe bend, and by that pretty rectory into Llan-pwll-llin pool, the river emerges from its rocky channel and narrow valley, leaves the Llandovery strata, and here takes its course with more leisurely steps through the Old Red Sandstone formation. Leaving Llyswen, or the White Court or Palace, the valley expands, and, at Glasbury, we observe the river wandering through the wide level plain, as its Latin name of Vaga, the Wanderer, truly denotes. Here the Llyfni, flowing from Llangorse Lake, yields up its name and waters to the larger river; and now flowing in stately

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grandeur past the town of Hay (the ancient Gelle), the Wye laps the base of Clifford Castle, where Fair Rosamond, the daughter of the Earl of Clifford, was born; and thence to Whitney bridge, where for the present we must part with our fair companion, as the train whirls us away out of sight of its charms.

We hope some day to give an account of the early history of this famous river. We cannot do so now, but will just add a few words as to its future prospects. As we have said, the spirit of the age is to cultivate and make the most of our rivers, that is, by care and by the observance of proper regulations, so to manage them, that they may be made to produce the greatest possible amount of food. It is, indeed, gratifying to find that the little that has hitherto been done has produced most marked results. This very spring we have witnessed an abundance of salmon in our upper fisheries that has certainly not been equalled within the last ten years, and an increase in the size of those fish that is altogether without precedent. A salmon was taken as high up as Newbridge by angling, 39½lbs., and several over 20lbs.; and at Holm Lacey, four miles below the city of Hereford, the monster fish of 56lbs. was caught by the nets. This fish is the largest that has been taken in any part of the Wye. It was caught in Even-pit pool, in the Holm Lacey water, the property of Sir Edwin S. Stanhope, Bart., rented by Mr. John Stephens, fishmonger, of Commercial-street, Hereford. The men who actually caught it in the draught-net were Jonathan Haines, William Thomas, John Goodman, and Richard Andrews It was a cock fish, in excellent condition, fresh from the sea, and when taken from the water weighed 57½lbs. It measured 4ft. 8in. in length, and 2ft. 4in. in girth. Two other salmon were caught at the same draught, one 11 lbs. and the other 12 lbs. Numbers of others, varying from 35 to 15 lbs., have been taken, and this season the capture of a 25lb. fish has been an ordinary occurrence. In cultivating our river, the chief points we must look to are the discountenancing and prevention of all kinds of poaching, especially the killing of the young fry, the spawning fish, and the kelts. Then we must endeavour to place fish-passes on every mill-dam that now shuts out the fish from their natural breeding grounds. The Monnow, Lug, and Llyfni, with other tributary streams of large size, are now unproductive from this cause, and the evil is a serious one, as the produce of our river should be commensurate with the extent of its spawning ground. At the present moment one third of the area of the Wye district is undeveloped, and consequently barren. If we have pollutions of any kind flowing into the river we should resolutely deal with them, both for the sake of public health and of our fish, and should put a stop to such injurious and often wasteful practices When we have effectively done all these things, and so regulated the capture of the vast amount of fish that all proprietors, high and low, shall have their shares in due proportion, a great work will have been achieved, and we shall be able to redeem our promise to the public and to the nation, of supplying them with a large amount of wholesome food at a moderate price. We need hardly say, that in effecting this, the goodwill and

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assistance of the public themselves will be of the greatest service, and let the present marked improvement in this river be an encouragement to them, as it is to the conservators. The sea, where all our fish are fattened, has no limit to its capabilities, and the only limit imposed on the production of salmon in this river, and other rivers of England, is the extent of their spawning ground. The Wye with its course of 148 miles in length, and including its tributaries, a water shed of 1,655 square miles of country, is capable of producing vastly more than its present supply—until that is achieved, let no man stay his hand, or think the whole work accomplished.

But here we are at our journey's end! "Landrindod Wells" simply, yet conspicuously, printed on the yellow, gravelly bank, with lumps of white felspar from the rocks of the district, was an appropriate geological indication. A picket of observation had been sent out the evening before, so that there was neither doubt nor hesitation in the movements of the little army of science—full fifty hammers strong—as it marched from the station. The direction of the Llanfawr quarries was taken, and we noticed *en route* the following constituents: There was the President, C. Wren Hoskyns, Esq.; the vice-presidents, the Rev. T. Woodhouse and T. Curley, Esq.; Edwin Lees, Esq., F.G.S., Worcester; Arthur Armitage, Esq.; the Rev. Arthur Gray, Orcop; the Rev. D. P. Capper, Lyston Court; James Rankin, Esq., Bryngwyn; the Rev. B. L. S. Stanhope, Byford; Captain Pateshall; the Rev. E. Du Buisson, Breinton; Courthope Bosanquet, Esq.; the Rev. John Raven, Harewood; Rev. C. E. Hornby, Dewchurch; John Lloyd, Esq., Huntington Court; the Rev. C. Smith, Tarrington; Henry Dumbleton, Esq., Treholford; the Rev. E. Dumbleton, Brecon; Dr. Bull and Master Bull; the Rev. F. F. Reaveley, Kinnersley; Captain Thomas, Llanthomas, and Lieut. Greatorix; Rev. Wm. Bevan, Hay; the Rev. H. W. Phillott, Staunton-on-Wye; Marcellus Newton, Esq., Sugwas; the Rev. C. J. Robinson, Norton Canon; the Rev. H. W. Tweed, Bridstow; Captain Williams, Talgarth; the Rev. S. Alford, Glasbury; the Rev. E. J. Owen, Tretire; the Rev. John Hanbury; T. Fisher, Esq., Trebandy; the Rev. J. H. Jukes, Withington; J. Griffith Morris, Esq.; Rev. J. Williams, Glasbury; C. Averill, Esq.; the Rev. T. M. Beavan, Birch; J. E. Smith, Esq., Hay; R. H. P. Styles, Esq.; H. Eldred, Esq., Ross; Dr. Anderson; Rev. T. J. Thirlwall, Nantmel; E. J. Husband, Esq.; O. Shellard, Esq.; Rev. H. Bevan; Messrs. D. Griffiths, James Lloyd, John Pitt, T. Smith, and Arthur Thompson.

The Llanfawr quarries are not above five minutes' walk from the station, and there the whole party proceeded, under the close observation of some small bodies of the residents. These quarries are the source of most of the building stone and road material of the district. A large mass of trap rock, or greenstone, has been thrown up by volcanic action through the Llandeilo flags in a molten state, and the intense heat produced has completely baked and altered the adjacent rocks. The enormous power exerted has thrown the strata of the Llandeilo flag in different directions, a large portion taking the most general dip of the common towards the west at an angle of about 40°, and

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another portion being thrown with a northern inclination at a still more acute angle. These flags contain organic remains of *Ogygia Buchii*, *Trinucleus fimbriatus*, *Trinucleus concentricus*, and others characteristic fossils of the strata, but they are more sparsely scattered than in the Builth quarries, and require a patient persevering search which the time at the disposal of the Club did not admit. The route was next taken across the common to the Pump House hotel. The pump-room was thrown open to the visitors free of charge, and most of them tasted the celebrated Saline Waters and the Sulphur spring. The surprise was general at finding them so little disagreeable, and some even preferred the taste to plain water. The Saline spring issues at a higher level by nearly 20 feet than the Sulphur spring, but both come from the Llandeilo shales. As faithful chroniclers we must here state that another tap was also pretty generally tried, and that was the excellent bitter beer of the hotel.

At the word of command of the President the march was again resumed through the grounds for the bog at the upper edge of the common — the bog "of great botanical capabilities" — as the circular stated. Right well the botanists attacked it, turning its flank through a meadow, in they went like a pack of foxhounds to cover—jumping from tuft to tuft, passing along slender ridges between dark and ominous holes, under the enthusiastic guidance of Mr. Lees and Dr. Bull, who evidently had been there before. The pretty cotton grass—*Eriophorum angustifolium*—waved its silky spikes at intervals over the whole bog. The graceful marsh cinquefoil, *Potentilla comarum;* and the more rare silvery-leaved marsh St. John's wort *Hypericum elodes* were there; the beautiful marsh clover, the trefoil bog bean, *Menyanthes trifoliata*, showed still a few spikes in flower which were eagerly seized—

"Oft where the stream meandering glides,
Our beauteous *Menyanthes* hides
Her clustering, fringed flowers;
Nor mid the garden's sheltering care
Of famed exotics rich and rare,
Purple, or roseate, brown, or fair
A plant more lovely towers."

Two orchideous plants were also gathered there, the *Orchis latifolia*, and the more uncommon *Gymnadenia conopsea*, and the marsh Pedicularis, *Pedicularis palustris*. The *Sphagnum*, and the goldilocks moss, *Polytrichum commune*, were there of course, but in vain was the bog searched for the flowering fern, *Osmunda regalis*, the bog myrtle, *Myrica gale*, or the sundew, *Drosera rotundifolia*. Great was the astonish-ment of the residents as they stood in knots on the common above, to see such a hunt, but if they looked for casualties, none of importance occurred. But what is that gathering in the meadow close by? A beautiful single-headed thistle has been discovered, which Mr. Lees pronounces to be the *Carduus pratensis*, and they are all busy gathering specimens.

The other plants observed during the day were the cross-leaved heath, *Erica tetralix*, just beginning to show those waxen flowers that give such grace to the sedgy moors where it abounds, the pink flowered dwarf *Pedicularis sylvatica*, the dwarf gorse, *Ulex nana*, the heath bed straw, *Galium saxatile*, and

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the rough *Juncus squarrosus* were all found spread generally over the common, and here too was found by close searching the plant of the day, the rare and beautiful mountain everlasting, *Gnaphalium dioicum*. "As the Amaranth flower is the acknowledged symbol of immortality, with equal propriety," says old Withering, "may the *Gnaphalium* be dedicated to never ceasing remembrance, or that high sentiment which is

'—— of itself a holy tie,
Yet made more sacred by adversity,'

for such is the imperishable nature of this species that it retains a perennial bloom through successive years, and constitutes a principal ornament of the dried winter's bouquet, for the vase of the saloon or the head dress of our belles." It is one of the same species of plant when cultivated, that forms the "immortelles," in wreaths and crosses, of the continental cemeteries. It was very small and scarce on the Common, and but one single specimen was gathered. Amongst other plants not confined to one spot may be mentioned the pretty *Rosa tomentosa*, the blue sheep's bit, *Jasione montana;* the *Rubus suberectus*, partial to moist ground; the *Rubus Kœhleri*, and of course the mountain ash, *Pyrus aucuparia*, in all the woods. In the wood above the Pump House the oak fern *Polypodium dryopteris* grows—the fragrant heath shield fern, *Lastrea oreopteris*, was also gathered, but not plentifully.

The President, however, is growing anxious. With watch in hand he finds the time getting on, for in answer to the compliment paid by the residents of Llandrindod, in putting off their dinners to suit the convenience of the Club, a definite time for the geological address at the Boulder Stone had been fixed for their entertainment. This time was approaching, and all the *élite* of the place could be seen wending their way to the spot. The Club were soon there, and at the call of the President, Dr. Bull read the address for Mr. Curley, to an audience of ladies and gentlemen that could not have been less than one hundred and fifty.

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ON THE GEOLOGY OF THE LLANDRINDOD DISTRICT; ITS MINERAL SPRINGS; AND CONGLOMERATE BOULDERS.

By T. CURLEY, Esq., C.E., F.G.S.

Gentlemen,—The simple outline of the bold undulating hills, seen from all parts of this Common, would be enough to prove that this district has been the theatre of great volcanic action; but the further you inquire into the subject, the more you examine the rocks themselves, the greater will be your wonder at its magnitude and its incalculable power. The shock which broke through the vast thickness of stratified rocks previously deposited here not only allowed the large mass of molten igneous rock, which now forms the Llandrindod Hills we stand upon, the Coed Mawr, the Carneddau, and other hills of the district to pass through the fissures, but it so shook and separated the strata that the liquid rock poured in between them, and became bedded itself. At the same time, too, the astounding force was produced which raised those enormous masses of bedded trap and stratified fossiliferous rocks together, which form the large and lofty hills of Llandegley, of Gelli, and of Gilwern. We are now surveying a considerable portion of the largest trap district in Radnorshire, a district well described by that eminent man, who first read the true character of the Silurian rocks—Sir Roderick Murchison. It extends from Llandegley and Llanbadarn-fawr on the north and north east, to the environs of Builth on the south west, and is about ten miles long and five broad. From Llandegley to Builth the main ridges of trap are the Llandegley Rocks, Sunny Bank, Gelli, and the Carneddau. Besides these a great entrenchment is thrown out, which concerns us to-day. It is on the north-west, by Carreg-gwiber, and Cwm-brith-hill to Cefn Llys, and the hillocks north of Llandrindod Wells. There are also others out of our present field.

Many of these trap ridges inclose longitudinal valleys, running from north-east to south-west. They are excavated in the lower Silurian shale and flags, the beds being tilted in divergent directions upon the opposite sides of the intrusive rock. Many of the shales and flags are very much altered in character at the points of contact with the trap. They have undergone considerable changes in their mineral character, from the intense heat evolved, and thus veins of quartz, and occasionally metals (lead in this district), coats of anthracite, cavities filled with green earth, hardened silicious rock, &c., &c., have been produced.

The period at which these great changes occurred it is impossible to define. Igneous rocks have been produced by volcanic action at all geological periods. Similar trap rocks to these can be shown to have been thrown out both before and during the formation of the Laurentian, Cambrian, and the Carboniferous rocks. If we compare the columnar basalt of the Giant's Cause-

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way with the lava poured out in Iceland in 1793 it would be very unphilosophical to take for granted that the effects of subterranean heat surpassed at remote eras the corresponding effects in our own times. The trap rock in this district differs very much in its character at different places, as it usually does.

The stratified rocks in connection with the trap are for the most part the lower Silurian rocks—the Llandeilo flags, tilestones, and shales, and in the Llandegley Hills the Caradoc sandstone; but in the dingle below (the blacksmith's dingle), leading to the Rock House Hotel, the Wenlock shale crops up, and in the valley of the Ithon the perishable mudstone of the upper Silurian group appears. The subsoil of the valleys mostly consists of black shale, schist, and sandstone, mixed with the clay detritus from the trap above, but the subsoil of the higher lands—like this Common—is composed chiefly of a cold yellow clay from the decomposition of the felspar of the trap, and though interesting to botanists, perhaps from the plants which prefer it to a better soil, it presents to the agriculturalist a barren and unfertile district.

The quarries at Llanfawr which you have just visited, show well a highly crystalline greenstone, in conjunction with the Llandeilo shales, whose strata have been thrown into different angles by the trap eruption, some dipping due North and others West. The greenstone is there composed of hornblendes and grey felspar more or less crystalized. The same rock appears near the wells. The hillocks around the church are amygdaloid, with kernels of quartz, sometimes coated with anthracite. These and other varieties of trap protrude throughout the district, in almost countless bosses, and wherever they occur the black shale, the schist, or flagstones between them are highly indurated, dislocated, altered in structure, and always more or less contorted.

At one of these points of contact the Mineral Waters of Llandrindod issue from the black shale. Sometimes, as at Llandegley and Builth the stratified rocks have been so contorted as almost to stand on end, and the interstices between them, through which the springs issue, may be compared to the conduit pipes of an artesian well, with this difference, that the waters themselves receive additional impregnation from the rocks they pass through. The structure and mineral constituents have been much altered by the intense heat to which they were exposed, but less so, as a matter of course, as they lie more distant from the molten trap. In this way is explained the varying character of the springs, as they issue, perhaps very near to each other, from different strata of the shale or Flagstones. Those containing most sulphur are usually nearest the trap rock. Then come the strong salines and chalybeate springs, which become weaker in their qualities as they approach the unchanged rocks. This description applies more forcibly to Builth than Llandrindod, where the sources are somewhat further apart. The rocks generally contain sulphuret of iron, but Sir Roderick Murchison has never seen it in such "crystallized bunches" and large "flat nodules, an inch or an inch and a half in diameter," as in the altered rocks at their junction with the trap.

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The Saline water in this district comes doubtless from the vast emporium of salt which was left to impregnate the rocks by the rapid evaporation of huge bodies of sea water lifted up by the same volcanic power which raised the rocks themselves. The general character of the salts of the saline springs throughout England, resembling so closely as they do the residuum of sea water, suggested this origin, and here, as elsewhere in many springs, the celebrated chemist Dr. Daubeny, on searching specially for those peculiar constituents of sea water, Bromine and Iodine, has discovered traces of them. No appreciable change has been observed in the properties of these springs, nor is it likely, says Murchison, that there will be for countless ages, so abundant are the constituents in the rocks from which they issue.

Let me now proceed to draw your attention to this fine Boulder of conglomerate rock and the numerous others of smaller size scattered about on the common. This large one is still, as you see, a very fine block, and with the fragments near it, gives a measurement of 1,300 cubic feet, and weighs about 100 tons. Some few years since it was double the size it now is. At that time the roadmakers blasted away a considerable portion for metalling the roads, and they would have used, I am told, still more of it lately but for the timely interferance of the Rev. Mr. Thorsby. It is composed, as you see, of that hard conglomerate rock which is situate immediately above the Old Red Sandstone, and between it and the Mountain Limestone—of this rock you will remember the club saw many fine specimens in situ at Symond's Yat last year. They occur also at the summit of Pen Cerrig Calch and some other places. It rests, as you see, on the ends of the strata of the Llandeilo flags as they are thrown up by the trap which has formed the hill into an angle of about 40°. The Boulder is entirely different in character to any of the rocks here. There is none of this conglomerate rock in this immediate district, and there is none to the north, from which direction this block must have come, nearer than Flintshire. It could not have been brought here by human agency; and the question is how it could get here—a question with reference to such boulders that puzzled geologists for many a long year! Eleven years ago, when this particular boulder first came under my notice, it was the prevailing opinion of the neighbourhood that the devil kicked it out from his shoe as he passed over the common. If he came here "to drink the waters," as the fashion now prevails, it is to be presumed he would confine himself to the "Saline Spring," and, indeed, the very existence of the Sulphur Spring is, by some people, considered as proof positive that the devil had most certainly been here. Such absurd notions are happily passing off. Without troubling you with all the many theories brought forward by the puzzled geologists to account for the presence of Boulders of a different character to the rocks prevailing in the district where they are placed, I will simply state that it is now universally agreed by geologists and philosophers, that the only explanation, and the true one, is, that they have been transported by ice. This large boulder, then, and all the others, though they now stand 694 feet above the mean level of the sea, have been

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brouht here by its waves; they have been floated here upon ice, and deposited on this common at that distant time, when it was covered by the icy waves of an Arctic sea. It is not to be expected that this view will be believed all at once. It is only a few weeks since that I met with such fierce opposition to it from a well-educated gentleman here, that I will now take some pains to prove to you, at any rate, its possibility.

Sir Charles Lyell, one of the greatest living philosophers, proves, on evidence it is impossible to resist, that the glacial period lasted for thousands of years, and yet that it was of so modern a geological date as to belong almost to the time, when shells of the same species existed, as are now found in higher latitudes. It is the geographical range only that is changed. An artic fauna was then enabled by the low prevailing temperature to invade the now temperate latitude. Thus marine shells of living artic species have been found in some of the glacial drift of Scotland, which do not, and could not, exist in the present temperature of her seas. The inference is unavoidable, that the earth's surface has experienced great changes of climate since it has been inhabited by animal life and it is quite possible that such changes can be reconciled with the existing order of nature. We must not regard the climate of England as a type of the temperature which all countries placed under the same latitude enjoy. Isothermal zones—zones of equal warmth—are neither parallel to the equator nor to each other. The mean annual temperature may be the same in two places with very different climates, for the seasons may be nearly uniform, or they may be violently contrasted. The causes which co-operate to produce these effects are as various now as formerly, such as the geographical distribution of land and water, ocean currents, the precession of the equinoxes, the eccentricity of the earth's orbit, &c., &c. Let us consider for a few moments the last cause only, which in itself proves enough for our purpose.

At present the earth's orbit is becoming year after year more circular, and as a natural consequence its seasons warmer and more equable in temperature. In 23,913 years from the present time it will be as circular as it ever can be, or in other words the earth's orbit will then have its minimum of eccentricity. After this time its orbit will begin again to increase at the same slow rate. These perturbations are caused chiefly by the attraction of the planets Jupiter, Saturn, Venus, and Mars, and their extent, astronomers have been able to calculate. The extreme range of this eccentricity amounts to 14½ millions of miles. At the present time it is three millions of miles, and this difference, though it may seem small, would involve a loss of no less than one-fifth of the entire heat derived from the Sun, for the heat would vary inversely, as the squares of the distance from the Sun. The consequence of the loss of one-fifth of the temperature in that hemisphere in which winter occurs, when the earth is farthest from the Sun, would be, that all the moisture in the air would fall as snow, and the lessened heat of summer would not be able to remove the winter's ice. The earth's axis of rotation is now at an angle of 23° 28' to the plane of the ecliptic, and it varies about 48 seconds per century, owing to the action of the

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planets. Sir Charles Lyell has lately induced the Astronomer Royal (Professor Airy) to make calculations in order to determine exactly how long it is since the last high eccentricity of the earth's orbit occurred. He did so, and he found that the last period of the earth's greatest eccentricity happened 210,067 years ago. A further calculation for past and future ages, made for Sir Charles Lyell by another great mathematician, Mr. Croll, arrived at the same general result. It is enough at this time to state briefly that he proves the fact of the existence of a glacial epoch to which the earth has last been subjected, and that it had had previously a tropical climate. Taking into consideration all the co-operating causes, he shows that the degree of the eccentricity of the earth's orbit varies as it approaches its extremes at different times, on a calculation for a million of years preceding the present century and for a million of years to come. Permit me to refer you for further particulars to this most interesting table in Sir Charles Lyell's great work, which may be safely said, geologically speaking, to be the work of the day.

Taking, therefore, a wide and general view of the subject, we find on one hand the wonderful evidence afforded by our vast coal-fields, of a vegetation considered by most geologists to be tropical; the remains in deep-seated rocks of animals that now only live in tropical climates; making Geology tell us that at some very remote period the temperature in these latitudes was tropical. On the other hand, the surface marks on the earth; the deep grooves from glacial friction on our mountain sides; the drifts with shells of Artic species of animals; the presence of strange boulders, &c.; gives equal proof of an Arctic or Glacial temperature, at a much more recent period. Astronomy now comes with its calculations—whose exactitude at every eclipse never ceases to be a wonder—and tells us, point blank, that it was so, and in the order, moreover, that Geology points out. The earth's climate varies from one extreme to the other—Tropical and Artic. It had last the Artic temperature, and is now again gradually approaching a Tropical climate. The extremes are 233,980 years apart.

We can see the exact effect of a glacial climate at work in our own day. In the St. Lawrence, between latitudes 47° and 49°, the frost is so intense that during the short period of low water a dense sheet of ice is formed, which, on each return of the tide, is lifted up, broken, and thrown into heaps. As the tide recedes again, the packed ice is exposed to a temperature of 30° below zero, and all frozen together with the adjacent boulders—to be increased again and again as the tides throw up fresh ice, and to be cemented again as they recede, until at length the high tides return with a warmer temperature and the whole mass is swept away together. The light specific gravity of the ice enabling it to lift and float the largest boulders with ease. In this way one single boulder was carried away in 1837, that had been used as a surveying station. It was, therefore, well known; it contained about 1,500 cubic feet, and weighed 120 tons.

Such boulders are very common not only in the neighbouring county of Shropshire and Great Britain generally, but throughout Europe. Masses of

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granite from Cumberland are scattered over the moors of Yorkshire and South Shropshire;—similar masses from the Highlands of Scotland have thus been scattered over the plains of Mid-Lothian; granites from Norway lie on the flats of Denmark; and huge boulders from Lapland and Finland repose in the plains of Russia. If time permitted many similar illustrations might be given, but it is not necessary.

From causes now in operation, therefore, in other parts of the globe, we may learn that to the existence of a glacial epoch in this particular district we must attribute the presence of these conglomerate boulders on Llandrindod common. They are ice-transported, and were deposited by that great northern current of a glacial sea, which has scored our mountain sides with the masses of ice it brought down, and has left so many traces of its ice-bearing powers in the countless other boulders it has conveyed from immense distances. The deposit of marine shells in the stratified rocks; the existence of these ocean-derived mineral springs; and the presence of these conglomerate boulders, all alike point to a time when the hills above the Pump House stood by the sea side, and when this shelving common was the foreshore. The icebergs carrying these very boulders stranded on this shore, those lightly laden in the shallow water, but those bearing the heaviest burden in the deeper water, and thus, as you see, this large boulder holds a low position on the common. If you reject the evidence of these inanimate rocks—if you still refuse to believe that these health-giving springs are due to the salts of an ancient sea—what can you say to the testimony of those organic remains which your hammers knock out of the Llandeilo Flags after an imprisonment of hundreds of thousands of years? How is it possible to explain the presence of the remains of those trilobites and gastoropods, and numerous other shells so commonly found throughout the Silurian system, and whose occupants could only live in sea water? But I don't ask you to explain, rather I counsel you to observe and to study the facts before your eyes, and leave the complete solution of the mystery to that master-mind, to which the key may perchance hereafter be vouchsafed. If you still persist in asking, as the poet has well said it,

> What sea, receding from what former world,
> Consigned these tribes to stony sepulchres?

I leave the poet to answer you—

> Bewildered sage! proclaim thy Wisdom folly,
> And where thy Reason fails let Faith begin.
> The rocks have sacred secrets of their own,
> And teach the wise humility and praise.

Let the inhabitants of Llandrindod, or rather the lord of the manor of this common, preserve this fine Boulder henceforth from the roadmaker's hammer, and it will ever be an object of the highest interest to scientific visitors.

The address was listened to throughout with very great attention, and was much applauded at its close. It was read clearly and with much earnestness, and seemed to excite even greater interest amongst the Llandrindod audience than with the ordinary club members.

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At its close the PRESIDENT said that although it was not quite in order to propose a vote of thanks for the address in the field, he felt sure that all who had listened to this very interesting paper would feel that he had not done his duty if he did not at once express the pleasure that had been given them. The character of this fine boulder had been thoroughly established, and would be more carefully preserved henceforth. Their time was very short here to day, and he had to announce to them that, as mentioned in the programme, instead of visiting the Five Tumuli and the Roman Station, they would proceed down the Blacksmith's Dingle towards the Rock House and the beautifully-wooded banks of the Ithon, where the Lover's Leap is to be found. The Tumuli, supposed to be those of ancient Celtic Chieftains, have been opened a long time ago, and, it is said, that beyond a ring or two nothing was found, and the Roman Station was merely a temporary station, and though it presented signs of entrenchment and was approached by a Roman road, there was not really much interest attaching to it. They were situated about a mile and a-half away, and it was thought they could spend better the time it would require to visit them. Before they moved on, however,

Mr. E. LEES, F.L.S., at the call of several members of the club, said that he would only add a few remarks illustrative of ice-transport in addition to what Mr. Curley had so well brought out with respect to the floating power of icebergs. Striking his stick forcibly upon the huge boulder, as if he had expected again to rouse it into motion after its long repose, Mr. Lees said that this monstrous stone reminded him of the celebrated *Pierre-a-bot*, or toad-like stone, formed of granite, which now lay far from its native bed, near Neufchatel, in Switzerland. But the *Pierre-a-bot* was much larger and higher than this stony mass at Llandrindod. It was the general opinion of geologists that the great Swiss boulder had been conveyed on the surface of a glacier for above fifty miles across the whole valley of Switzerland, when an enormous glacier filled up the distance to the mighty mass of Mont Blanc, to the granite of which mountain it belonged. He had himself paid great attention to the glaciers in various visits to Switzerland, and it was very instructive to behold the great masses of granite on the surface of the glaciers—particularly the Mer de Glace, near Chamouny—which had fallen at different times in hideous ruin from the lofty precipices that surrounded the glacier. These were slowly carried along by the motion of the glacier, year after year, however great their dimensions, till, on arriving at the edge of the ice, which was always melting during the heat of summer, they were precipitated into the valley below, there forming masses of debris commonly called *moraines*. The old moraines proved decidedly the far greater extension of glaciers in Switzerland during past ages, and they had much lessened in modern times. The great "rock tables," as they were called, that formed most formidable obstacles in a march across the glaciers, and which were elevated much above the surface by their preserving the ice beneath them unmelted, were magnificent objects to behold, and their annual progress could be traced. Here, then, alone did he differ from his friend, Mr. Curley, in proposing another

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solution for the transport of this conglomerate boulder so far away from its pristine position. In the glacial epoch this island, and the whole of Europe, was covered with a load of snow and ice, and if the land here was then, as was probable, elevated above the sea bed, then far away to the north an extensive glacier connected with those known to have existed about the Snowdon range spread its icy embraces over the country, and on the surface of that glacier this monstrous boulder was carried as a rock table, and finally deposited among the moraine on the common formerly more scattered about than now apparent from the changes that had taken place on the surface of the ground. Smaller stones were easily moved away, but this giant could only be stirred by the gunpowder that had been applied to it. There was a slight smell of brimstone in Mr. Curley's paper, which had been easily dissipated, but he (Mr. Lees) understood that the feeling in the neighbourhood was so strong as to the demoniacal power that had thrown the great boulder in its present place, that certain residents of the vicinity had threatened to attend this day and contradict any suggestion that opposed the popular belief (laughter). No friend of the devil's had, however, put in an appearance on his behalf, and so he trusted that superstition was not so rife among the residents of the health-giving Springs of Llandrindod as had been so confidently asserted (applause). Whether they accepted Mr. Curley's explanation of iceberg transport, or his own along the surface of an extensive glacier in the great icy epoch, there could be no doubt that the enormous boulder stone they saw before them was placed there by natural means. Marks of the evasion made by moving ice was clearly traceable on many of the rocks around Snowdon and other Cambrian mountains, as well as among the Grampians of Scotland, so that the former presence of extensive glaciers among the lofty eminences of Britain was a fact not to be controverted.

This ended a lecture and discussion that caused no slight excitement among the visitors to Llandrindod, and deserves to be recorded in its history, for assuredly such an assemblage had never before gathered around that mystic "stone of power" to hear its secrets revealed; and the cloud of superstitious and even ludicrous legendary lore that has so long held possession of its guide-books must now give place to sounder scientific matter.

The picturesque Blacksmith's Dingle was then visited. Here a small stream runs over the Wenlock Shale ridges very prettily, and from this slaty shale issues the Chalybeate spring of Llandrindod; and lower down a filtering of water oozes up, which is the celebrated "Eye-water," as remarkable as any of them, if the wonders related of it can be depended upon. From the Rock House Hotel below some gentlemen visited the high and pretty, and shady wooded bank above a wide bend of the river Ithon. Here the "Lover's Leap" is situated, which apparently wants a legend. We commend the subject to a poetical visitor. Gradually all strolled over the common past the so-called "Druidical circle" to the Pump House Hotel. Here, during the few minutes which intervened before dinner, Dr. Bull distributed to such of the members

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as desired them, many plants, some of them choice and rare. There was the *Eriophorum vaginatum*, the *Montia fontana*, the beach fern, *Polypodium phegopteris*, and the rare green spleen-wort, *Asplenium viride*, which grows on the *Travertine* of the Taren Esgob, above Capel-y-ffin, in the Black mountains. And from the rocks which form the romantic gorge of the Wye above Builth—near Gwyn's seat—were several very interesting plants: the rare English Stonecrop *Sedum Anglicum*, the variety of the Golden rod called *Solidago vigaurea Cambrica*, the water dropwort *Œnanthe crocata*, and the very and interesting chive garlick *Allium Schœnoprasum*, which grows in great abundance about those rocks, but in very few other places.

The excellent dinner provided by mine host was not over, when the business of the day was resumed by the exhibition of a very interesting entomological specimen, sent by Dr. McCullough, of Abergavenny. It was a large cluster of the female flies of the *Atherix ibis* on a small branch of the alder. "The females of this fly" says Dr. McCullough, "collect in clusters on branches of trees overhanging streams. There they deposit their ova and die. The larvæ as soon as hatched drop into the water. This specimen was found on the Monnow, near Pandy, on the 13th of June. Few of the ova now remain. Last year I found at the same place a cluster nearly as large as a small swarm of bees. A notice of this may be found in the Entomologist of August or September last. These clusters seemed to have been observed on a few occasions only."

The President then said that the next meeting of the club would be an extra meeting, when ladies would be admitted by special tickets. It was fixed to take place on Thursday, July 18th, at the beautiful waterfall, the Craig-y-pwll-du, between Boughrood and Erwood. It was hoped that the train would put the club down and take them up again at the place where the stream enters the Wye, so that the ladies would not have to walk much more than a mile. It would be necessary that this meeting should be a pic-nic meeting. All must take their own provisions, inasmuch as it was impossible to get anything near there. This plan had acted so exceedingly well at several archery meetings lately that he did not see why it should not do so with the Woolhope Club. It seemed to him that all they required to ensure a pleasant day was fine weather. Time was up, and a general move for the railway station was made at once.

Before the train arrives that is to carry off the Club, let us attempt a slight general description of the place. There is one question that invariably occurs to all fresh arrivals as they first walk on the common, and "Where is Llandrindod?" was the question asked to-day, again and again. Why, here, to be sure! "But where is the town?" There is no town! "The village, then?" There is no village! "People must live somewhere; where do they live? Where do visitors stay?" In three hotels chiefly, each pretty closely concealed in its own grounds —each at a distance from the other, and no two of them visible at the same time. The Llanerch Hotel is nearest the station, a clean, roomy,

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pleasant-looking house, that to all fresh comers seems "sole occupant of the plain," for the little station itself is almost hidden in a cutting. The Rock Hotel you may discover lower down, in a picturesque dingle, near, but high above the Ithon, cosy but comfortable-looking, clean and neat as paint and fresh railings can make it; with a newly-made croquet ground below, and with an air about the place altogether, that denotes rapid improvement and tells you plainly enough, that the pretty approach to it by the Blacksmith's dingle, will soon be planted: that an elegant light wooden bridge will lead from the croquet ground to a broad walk that will be cut through the opposite bank of fir trees next spring; and that this walk will be carried on, if it may be possible, along the high wooded bank above the river, round the beautiful bend it makes there, to the commanding and secluded position of the "lover's leap," and the pleasant shade of the overhanging oak trees. Seats, too, which have begun to appear, will then be more frequent.

The Pump House Hotel is situated at the upper side of the common, at least half-a-mile from the Rock-house, and is quite inviaible until you reach the groves of firs, and alder, and oak trees that surround and conceal it. This is the original house, the chief hotel, with the overpowering advantage of the possession of the renowned Saline Springs. If Llandrindod must be fixed at a single definite spot, the Pump House Hotel unquestionably represents it. Here all the life and spirit of the place concentrates itself. Here every morning, from six to nine o'clock, all the visitors in the district congregate to drink the waters at the new Pump-house, and parade in the shady walks. Here, too, are the same signs of improvement, an additional dining-room and several new bed-rooms have been added to the house since last season. Here a double service is provided for visitors, a public table at 1 o'clock and 3 o'clock—the houses of Lords and Commons—as the phrase goes there. Here under the shade of its trees, the four-in-hand stage coach stands side by side with the new omnibus of progress, that hourly, to and fro, visits the railway station. Here too, doubtless next year, a piece of the adjoining wheat field, or the field below the garden, or both, will be added as croquet ground to the attractions of the place. Shelves in this pretty new Pump-house will soon have a stock of fancy tumblers, in coloured, or Bohemian glass, for sale, so that visitors may drink from their own private glasses and carry off with them a souvenir of Llandrindod. This and such other improvements will be effected as its spirited proprietor and its active manager seem bent on carrying out.

Besides these three hotels, sign-posts here and there tell you there are farm-houses that take in boarders, and, doubtless, there are, but they follow the prevailing misanthropical tendency of the habitations, and carefully seclude themselves from sight. The church on the hill-side is hidden by trees; if there are cottages there, where they are, is a mystery beyond the power of casual visitors to solve. And so it happens that as you stroll on the heathery common in the very centre of Llandrindod, you seem almost in the solitude of a mountain district.

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The Common itself is a glorious place, its size is only to be spoken of in miles; its position, high and dry; its surface undulated; and its air so pure, that as you admire the mountain ranges of Radnorshire before you, you find yourself involuntarily stretching your chest to fill it to the utmost. It has all the freshness of a mountain breeze without giving you the trouble of climbing to get it. It makes breathing a positive enjoyment. It is well to give all this in detail, for the spirit of change, alas! has invaded the Common. The city of Llandrindod, that is to be, is on paper, with the elevation of its crescents, its villas, its new church, its grand hotels and boarding-houses, &c., &c.; and there, unmistakably in the turf, are the lines newly cut for the allotment of considerable portions of it.

And what shall we say of the Mineral Springs? The lecturer ably gave us their scientific character; but what of their real utility? To laud them, would be in bad taste and suspicious; to decry them, worse. Take a walk there with some old habitué of Llandrindod,—specimens are always to be found plentifully in fine weather—and judge for yourself. Take your regular visitor by the arm (there is ample time, between the glasses!) and, having listened with interest, through the usual raptures on the wonders effected by "the waters," which you hear from every one, keep him to the point, and you will get all the anecdotes and all the floating gossip of the place. You will hear such a series of boyish freaks, learn such merry tricks, and see such proofs of practical joking, that if you have a philosophical turn of mind you will begin to think there is some truth after all in the language of an imaginary guide-book. "Truly blessed indeed to mankind is the possession of these health-giving waters. They strengthen youth, they invigorate old age, they heal the sick. Gently, and yet effectively, they purge the vile humours from the blood, restore to the body its proper powers, and leave the natural elasticity of spirits to develope themselves in all their pristine vigour and cheerfulness." You will be shown for example that pool in the Ithon where the poor old salmon was left by the too-rapidly receeding waters. There it was, clear at all times to be seen, and as the secret spread itself, every rod in the neighbourhood was put in requisition. Never pool was so continuously whipped! never salmon so tempted before with such a variety of flies and minnows, true and false! It availed nothing, however, for the cautious old salmon, though in a "fix," was "wide awake," and he became at length "the lion" of the day. Visitor after visitor was set to catch it, with due secresy and care; and each after the other, with his favourite apparatus, went out in high spirits to secure the prize, only to return back again crest-fallen to meet as best he could, the laugh of the company. The fish would not be caught. At length a well-known ironmaster appeared upon the scene, and all the Pump House visitors chuckled with glee; "We'll set him at the salmon" was the cry. The fresh arrival, nothing loth, with the fish in sight, resolved on its capture. The man took the bait readily, but not for an instant would the salmon look at the flies of the skilful ironmaster. Great was the quiet quizzing that went on at the table d'hôte, too great for its

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subject to bear patiently, and a wager, bottles round—not of "the waters" it is to be presumed!—was very quickly the result. The salmon was to be produced bodily to the assembled company within twenty-four hours. Sure enough the very next evening the great ironmaster appeared at the window holding it up by the tail with great satisfaction. The thin lanky sides of the fish bearing witness to the cruel useless murder—and since there was no Fishery Preservation Act in those days—the wager had no counterpoise. And this was the way of it; finding all his skill of no avail, he had sent off an express messenger on horseback more than forty miles, with a peremptory order to five of his men to start immediately with his salmon nets, and thus he had accomplished his object, albeit ingloriously! "That's the spirit that draws the metal from the rock," was the remark of a man who knew him well.

Then again (between the next glasses probably) you will be shown a Druidical circle of stones, in which the belief of the district and of the exhibitors too, perchance, is rapidly growing. A Druidical circle! no such thing! It is simply an enduring emblem of practical fun, made with the stones which formerly marked the road across the common, and if he should appear who could play the part of Edie Ochiltree with Monkbarns' imaginary Roman encampment, "Pretorian here! Pretorian there! I mind the bigging o't," it would be no less a personage—can it be believed?—than a grave and dignified Inspector of Education who was here "drinking the waters." After this it is surely unnecessary to give further examples of their exhilarating effects. Practical jokes of lesser degree abound—indeed they seem to be the natural effervesence of the place.

Come then, poor careworn humanity, sick, or surfeited, come to Llandrindod and drink health, strength, and vivacity from its springs! Come, and be *boys* once more! No one it is said ever stays there three days without wishing to stay longer and resolving to come again, and surely three days is a period short enough for the eradication of morosity and care.

The Club unfortunately could only remain a few hours. These passed agreeably enough, and after a prosperous journey home through the lovely vale of the Wye, their memory remains as bright and pleasant as the day was fine.

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The Woolhope Naturalists' Field Club.

MEETING AT GRAIG-Y-PWLL-DDU,

JULY 18TH, 1867.

Thursday last was the day appointed for an extra meeting of the Woolhope Club at the beautiful waterfall of Graig-y-pwll-ddu, in Radnorshire, between Boughrood and Erwood. On this occasion many ladies had been invited, and the weather was looked forward to with some anxiety. "You will never be able to go on with 'Ladies'-days,'" said the energetic manager of a neighbouring Field Club; "we had them at one time, but the weather was invariably wet, and we were obliged to give them up." This lugubrious prophecy never seemed more likely to be fulfilled. It had rained heavily the day before, it poured in the night, the barometer was falling, and now heavy clouds, with loose scattered edges, hung over the sky, and seemed ready to scatter their contents at any moment. It was certainly a day for prudent people to stay at home, but then prudent people so constantly have to do so. The committee could take no prudential motives into consideration. They were to meet *al fresco* at the Moorfield Station at 9.10 a.m., according to programme, and at 9.10 a.m. they were there, with true English perseverance and pernacity. They were not left long alone, however, for members began to arrive, and ladies, yes, ladies! in twos and threes, called for their attentions. When the train left the station "Twenty-eight tickets wanted for the Hereford party," was the message telegraphed by the clerk to the Three Cocks Junction.

Our excursion again follows the course of

> Plinlimmon's fairest child,
> The peerless Wye.

but we are actually off without "transacting the business"—of course the committee this—they elected unanimously six new members, good men and true, to wit: The Rev. T. B. Beavan, Much Birch; the Rev. D. P. Capper, Lystone Court; R. Harcourt Capper, Esq., Northgate, St. Weonards; Edwd.

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Myddleton Evans, Esq., Llwyn-baried; Evan Owen, Esq., Builth; and the Rev. Thos. James Thirlwall, Nantmel Vicarage, Radnorshire; other new members were proposed; bills were ordered to be paid, and then that tiresome minute book was closed. By this time matters looked more promising, and though station after station proved in a negative manner how many prudent people belonged to the club, the weather got brighter, and a pleasant day was in prospect. One solitary gentleman was the only addition to the travellers between Hereford and Glasbury, but here a goodly number—bright and cheerful—joined the ranks. The railway authorities had most kindly made every possible arrangement for their convenience. Not only was the train allowed to stop mid-way between Boughrood and Erwood stations to set them down, but a temporary platform was most thoughtfully provided, and a ganger and his men, with rough-and-ready good nature, were there to see that no accident happened, to help them out and help them off, and their hampers too, with all due security to themselves, and to the line. As the train moved on, it left behind a numerous company—a goodly muster of stout hearts and strong waterproofs, ready to brave a wetting, if need be.

The President of the Club, Chandos Wren Hoskyns, Esq., to the great regret of all present, had been unavoidably prevented from coming, and the duties of the day therefore devolved on the Vice-President, the Rev. Thomas Woodhouse. Besides Mr. Woodhouse, there were present T. Curley, Esq., vice-president; the Rev. W. Jones Thomas, of Llanthomas; Miss Grace Thomas, Miss Charlotte Thomas and Master W. Jones Thomas; Miss Greenly and Miss Alice Greenly, of Titley Court; the Rev. T. W. Weare and Mrs. Weare, Hampton House; R. Hereford, Esq., Sufton; Miss Hereford, Capt. Hereford, and the Rev. R. Hereford; Dr. Bull, Master Bull, and Master Alexis Bull; The Rev. Thomas Phillipps, Mrs. and Miss Phillipps, Dewsall; Dr. Alfred Smith and Mrs. Smith, Hereford; Miss Ashmore, Droitwich; John Lloyd, Esq., Huntington Court; C. W. Alford, Esq., Glasbury, Miss Alford, and Miss S. Alford; the Rev. R. H. Williams, Bridge Sollers; Mrs. Hanbury and Miss Louisa Goss, Hereford; Messrs. Herbert, and Carrington Smith, Worcester; F. C. Symonds, Esq., R.A., and Mr. Reginald Symonds; J. T. Owen Fowler, Esq.; Capt. Williams, Talgarth; Mr. and Miss Pitt, Freetown, Ledbury; Mr. and Miss Thompson and Mr. David Griffith, Builth.

The general arrangements for the day were announced, and under the guidance of Mr. David Griffith they moved out from the cutting in which they had alighted from the train.

The travellers found themselves close to the river Wye; which here flows through a narrow and romantic valley over a rocky bed. It is altogether unlike the sober and somewhat sluggish stream to which the inhabitants of our ancient city are accustomed. It rushes and tumbles from rock to rock under steep hill-sides covered with wood, or through deep and narrow gorges of contorted rock. The waterfall, which was the object of their expedition, is formed by one of the tributaries of the greater river called the

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Bachowy, which was interpreted to mean "Little rushing water," a name singularly descriptive of its appearance and character. It falls into the Wye immediately below the railway bridge; and its course upwards had to be followed for about a mile and half. The path lay along a narrow mountain glen. Down below, to the left, foamed and dashed the Bachowy.

> Now wind we up the glen, and hear below
> The dashing torrent in deep woods concealed.

Opposite rose a high bold hill, the hill of Garth, clothed on its slopes with luxuriant woods of oak, and looking back over the Wye, the Epynt range of mountains came the more into view the higher the path rose.

A considerable portion of the Trewern Hill has been recently inclosed. The wire fence—that spider-like web of advancing civilisation—has spread over its slopes. A fresh plantation of young larch on this side had taken the place of the oaks as it so frequently does in South Wales. Larch grows more quickly into money and is very valuable for colliery purposes.

The glen grew narrower and the path steeper and more difficult as the visitors proceeded, and

> "Not without frequent pause, as ever new,
> Some glorious prospect opens to the view."

On reaching the upper end of the glen they saw beneath them a deep, narrow, rocky chasm, clothed with luxuriant foliage on both sides: half way down this chasm and almost closing it up was a bare green promontory. This was the Craig-y-pwll-ddu—the rock of the Black Pool,—to which they were bound. The descent to it was by no means easy: but was at length accomplished in safety; and all the party assembled on the little table-land of turf and rock, the very pefection of a spot for a pleasant pic-nic. But where, all this while, was the expected rain? No signs of it were to be seen. The freshest of mountain breezes swept up the glen, the sun shone out as bright, and the air was as clear, as heart could wish. The turf was dry; and the wild thyme was in its gayest bloom: wild strawberries lurked in the crevices of the rocks; and the pretty tormentil *(Potentilla tormentilla)* studded the verdant carpet, on which the travellers were not unwilling to rest awhile.

Advantage was taken of this interval to give a brief account of the Geological features of the place. It was told how Murchison had studied the district and given a section of its rocks in his great work, "Siluria." He had shown that the stream here separates the Upper and Lower Ludlow rocks. The massive rock they were then upon was seated in the middle of the glen, and blocked up the stream, causing the waterfall below. It was a mass of Ludlow rock, and probably a landslip from the hill of Trewern which they had come down. The hill of Trewern was a continuation of the Bigwn Hills, and the chief formation of the range was the Upper Ludlow rocks, but over them, on the top and the southern side, the Old Red-Sandstone rocks appeared. This range will ever be remarkable for having first clearly shown to Sir Roderick Murchison the passage downwards from the Old Red Sandstone to the older rocks beneath

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them, and thus given him the key to the whole Silurian system. The rocks on the other side of the stream were all Lower Ludlow rocks. On the face of the perpendicular cliff opposite to them—a cliff some sixty or seventy feet high—the strangely twisted strata were pointed out. The complete loop they form is said to have been caused by the lateral pressure of the great volcanic force which threw up the Carneddau and other mountains of the district, but it is difficult to conceive how any pressure could have twisted rocks into so short and perfect a curve. "These contortions," says Murchison, "are amongst the most extraordinary to which the formation has been subjected." The visitors were then told that they would find some portions of the Lower Ludlow rock, almost composed of small shells, so numerous were they, and if they wished to procure specimens they could readily do so.

After this brief halt the pilgrims set out to visit the fall itself. It was no very easy task. The path was very narrow and often slippery; sometimes a mere ledge across a precipitous incline, at others twisting down suddenly amongst rough stones. Aided by the firm hands of the gentlemen always willing to assist, and here and there by a friendly hazel bough—which some thought safer still—many of the ladies were enabled to reach the bottom without accident.

The roar of the fall was now plainly audible, but it could not be seen. The stream had to be crossed and the ordinary bridge of fir trees was broken down. Mr. Griffiths, ever ready, had managed to construct one lower down, and here stepping from stone and across a plank only four inches wide, those who had nerves to bear the sight of the rushing water beneath, and the noise of the fall in their ears, got safely over. A path led towards the chasm, and entering it on a ledge of rock, the fall was in full view at the far end. The chasm extends some twenty or thirty yards. Craggy precipices from fifty to sixty feet high form its sides, and far above, the trees in full foliage from either side close in the top. At the far end, the stream, beaten into foam by its rocky channel, falls about twenty-five feet vertically.

It is difficult to describe the weird-like effect it produces. The noise of the fall in your ears; the dark frowning rocks, damp and chilly from the abundant spray; the peculiar gloom of the chasm itself, heightened as it was by the little glimpses of bright sunshine which could be seen through the trees in one or two places, far overhead, all combined to keep you to the spot, though you would fain get away. The feeling of awe was added to picturesque beauty, making it at once attractive and repellant—a feeling that called Hood's lines into remembrance, in spite of the fair ladies present:—

> And over all there hung a sense of fear,
> A sense of mystery the spirit daunted,
> Which said as plain as music in the ear
> The place is haunted.

The green leaves of the liverwort, the *Marchantia polymorpha* crept freely over the rocks, and here and there a fern. It seemed the very place for ferns, but they scarcely grow there at all.

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The recent rains had increased very much the volume of the water without making it muddy, and thus the fall and the river were seen to the greatest advantage. It had just that slight stain so pleasant to the eye of a fisherman which made some of the gentlemen wish for their trout rods.

But it is not the waterfall, nor is it the dark rocky chasm that gives its name to the place. It is the deep black pool at some little distance from the foot of the fall itself. "I can't see the bottom here" said a young lady at the pool. No, indeed, how should she? The great doubt has ever been as to whether there was a bottom to it. Tradition says that, once upon a time, some bold natives resolved to find out. They got the four bell ropes from a neighbouring church and tied them together, with the big bell at the end, and thus they tried in vain to fathom it. The legend is very imperfect. Whether the weight of the bell pulled down all the unbelievers from above? whether the bell itself ever came up again? or what doleful result happened to give the pool its mysterious name, none can tell; tradition sayeth not. Nor was there much time to ponder on the subject, for the voice of the practical Griffiths was heard—"It's nine feet deep; I measured it myself." After this, visitors began to breathe easily once more, and sketching became the order of the day. In one book an excellent artistic effect was produced in a very short time, but in another scratches here and scratches there, no doubt held the germ of everything, but it did require a large exercise of the imagination to see anything. One gentleman, however, was not sketching, though closely examining the spot; nor was he giving the reins to romance, though in deep thought. Neither fairies, nor gnomes, nor goblins of any sort troubled him. "How to get salmon up there" was the practical turn his ideas took, and he concluded it could be done by a succession of pools beginning at some distance off. This idea, disposing at once, as it did, of the fine waterfall and the black pool together—or some other unexpressed feeling—sent everybody up the rock in a hurry to the hampers and cloaks.

Below the upper or great fall, there is another a hundred yards or so further down, but which cannot be compared in beauty to the upper fall. It is broader, more broken, and probably not more than sixteen feet high. Below it there is a wide deep pool. We were told that in the winter time large numbers of salmon come up from the Wye to this fall, but never could get over it. They are often killed here as they jump vainly at the barriers, and so, conservators, you must be on the look out. Fish ladders, though possibly quite practicable, are not to be recommended here; we must first remove or make accessible, artificial obstacles, before we touch those natural barriers, our beautiful waterfalls.

When half way up the steep ascent you almost look into a hawk's nest, built in a hole in the opposite precipice. The cries of the young ones were heard, too. It was probably a kestril's, but the old birds kept out of sight. Not so some sparrow-hawks which were flying about the hazels in much anxiety. They

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had a brood of young ones which had just left the nest, and one beautiful bird unfortunately fell a victim to a rough attempt to capture it.

The bright sunshine and fresh mountain air which swept across the little promontory were most refreshing: albeit it placed hats in danger and made rocks useful to . . . . keep down tablecloths! All the little groups assembled in close proximity produced an effect as picturesque as it was merry and cheerful.

Let us leave them there, and go down into the glen above the fall through the brushwood and hazels, where the stream rushes rapidly down its rocky channel.

> Hie away, hie away,
> Over bank and over brae,
> Where the copse wood grows the greenest,
> Where the fountain glistens sheenest,
> Where the Lady Fern grows strongest,
> Where the morning dew lies longest.
>
> Hie to haunts right seldom seen
> Lovely, lonesome, cool, and green.

Here are ferns in luxuriance, and here, too, was found the treasure of the day, a couple of fronds of the moss-like graceful filmy fern, *Hymenophyllum Wilsoni*. No more grew there, but in some concealed nook higher up it probably grows in much greater abundance. The brittle mountain fern, the *Cystopteris fragilis*, grew well and plentifully. Here the pretty oak fern, *Polypodium Dryopteris*, grows in abundance; and, here, a little further up, grows the elegant beech fern, *Polypodium phegopteris*, which only two or three visitors gathered. Here, in the shade of the underwood, grow the commoner kinds in great luxuriance, the fragrant mountain fern, Withrings fern, the prickly shield ferns, and the delicate Lady Fern luxuriantly.

Itis scarcely safe to linger too long in getting their roots, for all are busily engaged on the rock above with the good things provided.

No sooner was the feast over than the party assembled in the central part of the rock and prepared for the more scientific business of the day. A more romantic lecture-room cannot be imagined, and if the geological description had not been given, no observant spectator could have failed to notice the peculiarities of the scene.

The President for the day, the Rev. THOS. WOODHOUSE, briefly opened the proceedings, and having expressed his regret at the absence of the President of the Club, he called upon Dr. Bull to give them an account of the Yew trees of Capel-y-ffin, which he had recently visited with Mr. Lees.

Dr. BULL said that he simply wished to have given the measurements of the very interesting trees of Capel-y-ffin, by way of an additional illustration to the very able paper on Yew trees, read to the club last year by Mr. Woodhouse; but learning yesterday that we were to lose Mr. Hoskyns' paper, he had added some remarks on the church itself, which he trusted would produce some little discussion. The subject was, whether the church had come to the yew trees in this instance, or whether, as Mr. Woodhouse maintained was always the case, that the yew trees had been planted for the church.

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CAPEL-Y-FFIN, ITS YEW TREES, AND ITS CHURCH.

The yew trees at Capel-y-ffin are more remarkable for their mode of growth and apparent age than for their large size. They are, for the most part, tall upright trees with a central stem or stems. They are long past their prime, and present an appearance, at once rugged, grim and hoary. They are situated on the south side of the churchyard, and are planted in a semicircle. There are seven trees, two on the left, and five on the right of the entrance gate, and it almost seems as if one or two trees had been removed specially for the entrance. The circumference of the trees is as follows. On the left, as you enter, the first tree—

(1)—measures 13ft. 10in., at 5ft. from the ground,

and the next—

(2) ,, 14ft. 2in. ditto ditto.

The finest and tallest trees are to the right of the entrance gate, and, beginning next to it, they measure in circumference—

(3)—14ft. 6in. at 1ft. from the ground. Numerous small boughs prevent its being taken higher.

(4)—16ft. 2in. at 5ft. from the ground.

(5)—13ft. 6in. ditto ditto.

(6)—18ft. 6in. ditto ditto.

This tree is a very remarkable one. It is split into three boles—though all are united together when the measure is taken—one bole is hollow and completely filled by a large mountain ash of at least a hundred years growth. The two other boles are solid and shoot up from twenty to thirty feet before separating into branches, and the last tree

(7)—measures 11 ft. 8 in. at 5 ft. from the ground.

The position of these trees at the junction of three vallies; the fact of their being planted in a semicircle; their very great ages; together with the absence of any indication of age about the church itself; leads to the inference that the trees existed long before the erection of the church. Was this a spot sacred in ancient British times? Were these trees planted as a consecrated grove for Pagan worship? Did the early Christian missionaries avail themselves of a place already sacred in the estimation of the people on which to preach to them? Was the good Bishop buried here who, tradition states, fell over the rocks close by (The Taren yr Esgob) when escaping from his enemies, and broke his neck?—are questions more easily asked than answered.

The name of the church "Capel-y-ffin"—the "Chapel of the Boundary"—it is said bears out the inference of its having long been a place of note before the church was built. The conclusion of the word "ffin" being of very ancient use for "a boundary"—in this instance probably meaning the boundary between England and Wales, and not the boundary between the three counties of Brecon, Hereford, and Monmouth, as some suppose, and which spot is a mile off on the top of a neighbouring hill; whilst the use of the word "Capel,"

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instead of "Llan" is clear proof that the church itself was built in Roman or Mediæval times. There does not seem to be any record of the building of the church. Indeed, up to the year 1708, there appears to have been considerable doubt as to what parish it belonged to, some considering it in the hamlet of Blanbwch, in parish of Glasbury, and others that it was in Llanigon parish. In that year there was a long dispute in the Ecclesiastical Court. One Lewis Thomas, clerk, Vicar of Llanigon, refused to do duty there, to bury or to baptize, alleging that there was no salary attached to the cure. He had, however, already officiated there for ten or twelve years, and he was ordered to continue to do so. Since that time it has been considered as a chapel of ease to Llanigon, and a grant from Queen Ann's bounty has been given to it. Jones—from whose history of Breconshire these particulars were obtained—says that some portion of the land near it still pays tithes to the parish of Glasbury. A recent pamphlet by the Rev. Nash Stephenson, states that Capel-y-ffin, or Glynfach, is now a perpetual curacy of the annual value of £55—in the gift of the Bishop of St. David's. It is worthy of a visit he says "to see the condition to which a building of the Church of England may be reduced when neglected and uncared for by its legal guardians and friends." Its yew trees are certainly very interesting—and well worth a visit—and when we were there, a fine specimen of the field thistle *(Carduus arvensis)* could not escape observation, for it grew in great luxuriance, full a yard high, on the step of the churchyard stile!

Dr. Bull went on to say that the district of Capel-y-ffin for many other reasons was most interesting. Not only was there the fine range of rocks called the "Taren yr Esgob," which had been alluded to, along the side of the mountain; but within a mile of the church was the beautiful waterfall of the Honddu; and at a short distance from the fall, the very large and interesting mass of Travertine, which was called "Twlch-y-foel-las," or the cave of the grey stone. It is about twenty-four feet wide, thirty feet high, and two hundred and ten feet in circumference, and has within it a hollow capable of holding several people. It seems to have fallen down from the rocks above. At this time, on the rocks above, there is another enormous mass formed by the springs which issue there, and which seems only to require a hard winter or two to become detached itself. Then there is also the rare *Asplenium viride*, growing on these Travertine covered rocks, and even on the great stone itself. The oak and the beach fern grow there plentifully, and the rare cotton grass, *Eriophorum vaginatum*, in abundance; and, of course, the scenery was very beautiful. There was so much that was interesting throughout the whole range of the Black Mountains—so many of the names of the places were so suggestive, and whose meanings seemed passing away—(examples of which were given)—that he could not help saying the "History and Legends of the Black Mountains" was a subject worthy of a good author, and he hoped some one would write upon it.

At the conclusion of the paper and remarks (which were listened to with great interest), the President rose, and said he was placed in a difficult position. He felt deeply indebted to his friend Dr. Bull for the pains he had taken in

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preparing, at such a short notice, such an interesting and amusing paper, and therefore could not combat, as he would, the position he had taken. Dr. Bull had attacked one of his pet theories; but gratitude must on this occasion keep him silent. He would rather take the opportunity of mentioning one or two other trees in that neighbourhood, which were worth notice, although they could not be included last year in his paper on "Herefordshire Yew Trees." In the churchyard of Llanstephan, not more than two miles from that spot, were some fine trees, one of which measured 22ft. 6in. in girth, and another 19ft. 6in. A fortnight ago he had found in the little churchyard of Llanfaredd a yew tree which, though hollow and battered, seemed to him at least 30ft. in girth; he had unfortunately had no means of taking the dimensions exactly. At Aberedw, a little nearer to that spot, there was also two very large trees. He might, in conclusion, be allowed just one remark on the argument that had been drawn from Capel-y-ffin. It was this: Although the existing church must have been built long since the yews were planted, might there not have been a still older church on the same site?

The Rev. W. JONES THOMAS made some interesting remarks on the name and history of Capel-y-ffin, the probable existence of a cross on the spot long before the church was built, and especially referring to a tradition which connected that neighbourhood with the first planting of Christianity in Britain. St. Paul was said to have visited this district, and there certainly was a pass through one of the valleys called "Bwlch Efengyl," or "The Gospel Pass" to this day.

Some further conversation ensued on the antiquity of the Welsh language, and the curious fact was mentioned that some derivatives in Latin which have no Latin root have a root in Welsh.

Dr. Bull gave also the dimensions of the Sarnesfield yew-tree, which was not given in Mr. Woodhouse's paper, and which had been kindly procured for him. This was a very fine tree. It measured 21ft. 3in. at five feet from the ground, and was said to be ninety feet high, though he scarcely thought it could be so high as this.

Mr. David Griffith had very kindly brought some beautiful fossils for distribution to the ladies, as a remembrance of the day. Very perfect little specimens of *Ogygia Buchii*, *Ogyia Portlockii*, *Phacops Daviesii*, *Ampyx nudus*, *Graptolites Murchisoni*, and some others, from the quarries near Builth; the *Calymene duplicata*, and the *Trinucleus fimbriatus* and *Trinucleus concentricus*, from the Llanfawr quarries, visited by the Club at the last meeting; and he had also that day knocked out from the Lower Ludlow rocks below, a fine *orthoceratite*, showing very well its cavities, and had procured several pieces of the rock, which was almost a mass of shells. These pretty specimens were distributed during the discussion, and were very gladly appropriated by the ladies present.

The PRESIDENT said he was compelled to remind his hearers that, interesting as this discussion had been, they had other matters before them; and he therefore begged to call upon the Rev. T. W. Weare for the paper which he had promised to favour them with.

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RECENT ASTRONOMICAL OBSERVATIONS.

By the Rev. T. W. WEARE, M.A.

There is an intimate "connexion" between the several "physical sciences," and this connexion will render the few remarks which I have been requested to make this day not inappropriate for the consideration of the Woolhope Naturalists' Field Club. It is the province of geology and its sister sciences to inquire into and illustrate the constitution of the planet on which we live, and the natural productions of the earth; and such subjects, in the general, form the staple of the investigations of our members; yet, nevertheless, we are compelled sometimes to look beyond this earth, and to gaze into the starry heavens overhead, for the *causes* whence have sprung most, if not all, of the operations which have made this earth what it is, and which now daily influence its "life" and "growth," for the terms are by no means inapplicable.

Here, however, it seems necessary, at the outset, to explain myself when I employ or accept terms or phrases which may be understood in a wrong sense,—in a sense, certainly, far different from that which the writer of these remarks would intend. The expressions the "life" and "growth" of the earth have been taken by some to imply an independence of existence, a self-subsisting, inherent power in itself, at once creative and developing. They have been taken to imply that the earth in no wise owes such creation and its subsequent development to a Creative Hand; or if creation by such Hand be conceded, it is denied that the same Power *now*, daily, hourly, and momentarily, sustains and upholds in its multiform operations that work of His hands which "in the beginning" was called forth into existence, in that day when "He spake the word, and they were made," when "He commanded, and they were created."

I have said that the *causes* whence have originated the workings which have laid the foundations of the earth's structure, and which still modify, alter, and develope that structure every instant of time as it passes, are to be sought for not on this earth but beyond it. They are to found in the heavens, and specially so in that great luminary, the centre of our system, which we call the Sun.

To examine, therefore, occasionally, subjects connected with the solar orb, or the planets of our solar system, is not beyond our province, as students of geology and of nature; and in obedience to the request of our President, it has fallen to my lot, as a duty to the society, to say a few words on this special subject. I could have wished that some other and abler member of our Club had been invited to address you this day, for I feel that I am myself but a learner in this, the grandest and most sublime of all sciences; and I repeat that I only respond to the President's call from a sense of loyalty to the Club, and a hope that my remarks, such as they are, will suggest subjects of deep thought and interesting investigation to many here present. The study, I can

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assure them, will amply repay the labour bestowed upon it, and it will lead them fully to endorse the sentiment of the poet, who bids us all to

Look through Nature up to Nature's God.

And here, to commence my special subject,—*where* shall I begin? The mind is lost in the contemplation of the vastness of the subject! It is not a question of searching for "Vestiges of Creation." The "Footsteps" of Him, who made all, meet us at every turn. In the height, and in the depth; in the expanse of the heavens above, as well as in the earth beneath, there is but one song, one chorus;—a chorus, which first burst forth at that day, when, "the morning stars sang together, and the Sons of God shouted for joy;"—a chorus, still echoed, and re-echoed through the vaults of space, by the myriads of bright orbs, scarcely reached by the most powerful telescopes, which, inconceivably distant though they be, yet cast their light upon this small speck, our earth,

For ever singing as they shine,
The Hand that made us is Divine.

But a selection must be made: and so, amongst the many subjects demanding notice, I would fain draw your attention to two agents, both connected with the sun, andboth having an all important influence upon the earth. I allude to the solar rays:—the rays of light, and the rays of heat; for they are not identical.

The researches into the chemistry of Light and Heat of late years have been eminently successful. The wonders disclosed by the *analysis* of the solar beam have madeus acquainted, in some degree at least, with the nature of the Sun's atmosphere. In that atmosphere, or photosphere, are now proved to exist materials of which thisour earth consists! In a gaseous or fluid condition float the elementary substances, which would seem to be the simple materials first formed by God's creative act (to speak with all reverence), and which he has since employed in the construction and maintenance of the whole of the material creation. For, not only in the Sun's atmosphere are found these elements, but also in that of every *Star* that has been tested; in that of every *Nebula* that has been subject to the power of this analyzing process! Differing from each other in their material essence, as we are also told they do in a more spiritual and sublimer sense, "for one star differeth from another star in glory," yet in this they all agree, that, in infinite combinations indeed, but still preserving their identity and individuality, there are detected in all the same grandly simple elementary substances.

Time was, it may be, when such a congeries of gaseous masses filled the whole space now occupied by the entire "enceinte" of our Solar System, even far beyond the verge of Neptune's utmost circuit, and still further even, beyond the "aphelion" point of the most erratic of our sun's cometary attendants. Heat and light were then in operation, as they are now: the laws of each, then as now, doubtless, in action with never ceasing energy. The nebulous mass, we may well believe from analogy, had its motion round an axis. Heat was radiated from the outer surface, to reach limits far away into the boundless

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expanse still further beyond. The parting with its heat implies a cooling, and cooling implies contraction of the mass. It is no assumption to suppose that in the then nebulous condition of the Solar System, we see the germs of that system as now it is known to us. Rotation round an axis, however caused, seems a necessary condition of matter, when unaffected, or but distantly affected, by matter external to itself. The great law of gravitation would cause masses unequally cooled, and by consequence more or less contracted, and therefore more or less heavy in proportion to bulk, to gravitate towards the centre. Hence, if from no other cause, would arise a swaying of the whole mass, and in time a motion round the centre of gravity, the point of rest of the vast congeries of atoms thus held together by cohesion. Rotation once commenced, a centrifugal force would be generated. Such force would tend to throw off portions of matter, which sudden cooling might nearly solidify; and hence, we may well suppose, were detached those separated particles of the original solar mass, which we now recognise as the planetary attendants of the Sun. The rings of Saturn seem an exceptional case, where a repetition of this process of detachment stopped short of breaking up into smaller bodies, known to us, in other cases, as the "satellites" of the primary planets. But there is an old proverb that the "exception proves the rule;" so, here, in this instance of Saturn's rings, we can detect a cause in operation, the results of which, in all other cases, have their visible expression in the "Moons," which accompany so many of the larger planets of our system.

Of this vast process of life and development, heat would seem to be the moving power. The functions of light, at this earliest period of creative formation, it is less easy to detect. But, to come down from these earlier ages of creation's life, to the present time, as we now behold the Sun, with his circling planets around, light, aswell as heat, becomes an agent all essential to the existence, and to the operations, not only of the animal and vegetable kingdoms, but even of the solid materials of the mass of the earth itself.

To dwell at any length on heat and its agencies, in ages long past, as in the "carboniferous era," or even in our own day, as to the variations of climates and seasons, would extend these remarks too far. But it may be of interest to touch upon, however slightly, the subject of the photosphere of the Sun, and to lay before you the most recent discoveries in relation thereto. I prefer to do this in the very words of the reports of the Royal Astronomical Society, by giving you a condensed statement of facts, leaving the application of these facts, and their bearing upon the special subject of study of our club, to the hearer.

Before I quote the extracts alluded to, I would remark that the process of discovery of the nature of the solar atmosphere was as follows:—The solar spectrum, formed by the prism, had long been known to men of science. In 1802, Dr. Wollaston was the first to observe some *dark lines* in this spectrum; vertical *dark* lines here and there, not separating the prismatic colours, but apparently arranged without order. These dark lines were subsequently more

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fully investigated by *Frauenhofer*, and with such exactness that, in justice, the lines themselves have since received his name, and are now known as "Frauenhofer's lines." Like the term "Bailey's beads," observed on occasions of a solar total eclipse, they have immortalised their investigator, and show that science is not unjust in distributing her honours amongst her faithful votaries. Several observers had subsequently made more or less successful advances to elucidate the nature of the dark lines of Frauenhofer, but it was not till so recently as 1859 that these researches received their crowning triumph at the hands of *Kirchoff*, on whom they conferred a still larger measure of scientific honour and celebrity. I will now quote the words of the address of the President of the Royal Astronomical Society, delivered in February last.

What Kirchoff did was this:—"In 1859, he propounded as a great natural law, that if a vapour, when sufficiently heated, possesses the property of emitting lights of certain refrangibilities, that vapour at a lower temperature has a tendency to absorb or refuse a passage to lights of the same refrangibilities which may be incident upon it. Kirchoff demonstrated this law experimentally in thecases of Sodium, Lithium, Strontium, Potassium, Calcium, and Barium. From the vapours of each of these metals he obtained those spectra consisting of intermittent *bright* lines, and then viewing these spectra through less intensely heated vapours of the same metals, the bright lines became reversed into *dark* lines. Here, then, we appear to possess a satisfactory explanation of the Frauenhofer dark lines of the Solar Spectrum. The solid or liquid superficies of the sun may be presumed to be incandescent, and hence as a solid or liquid to emit rays of light ranging through a vast variety of refrangibilities. Above this incandescent superficies we may conceive heated vapours of various metals or other ingredients to float; these vapours will absorb, intercept, or be opaque to rays of light of various refrangibilities, and hence, by this simple process, may arise in the Solar Spectrum the dark lines discovered by Wollaston and Franenhofer. In order to put this hypothesis to the test, Kirchoff, in 1860, caused a very powerful spectroscope to be constructed, so arranged as to permit him to observe the spectra of the vapours of several metals in juxta—or super-position with the Solar Spectrum; and in this way he identified the bright lines of the vapours of iron, copper, magnesium, and of other substances, with the dark lines of the Solar Spectrum."

So far as to what Kirchoff did:—"The question at issue was, (continues the address), Do the dark lines which were already well known to exist in the spectra of some of the stars, coincide to so absolute a degree of precision with the bright lines in the spectra of metallic vapours, as to warrant an undoubting belief in the corresponding metallic constituents of the stars themselves? To answer this question it was essential to do what had never been done before, viz., to obtaina juxta, or super-position of the stellar and metallic spectra."

This was accomplished by two eminent men of science, upon whom the Royal Astronomical Society have, for their discovery, conferred their gold medal for this year, the highest astronomical honour in Europe. By the labours and

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skill of Mr. Huggins and Professor Miller, no less than fifty stars have been scrupulously examined and tested as to their spectra. The address, adverting to this, thus goes on:—"The physical result of all this scrupulous and conscientious care was to discover the fact, or it may be to confirm the suspicion, that *the stars are in strict reality worlds fashioned in their material constitution at least not altogether differently from the fashion of the little orb on which we live!*" Such are the President's words; let us now hear these two discoverers speak for themselves. They say: These, spectrum observations, are not without interest also when viewed in connexion with the *nebular hypothesis* of the cosmical origin of the solar system and fixed stars. For if it be supposed that all the countless suns which are distributed through space were once existing in the condition of nebulous matter, it is obvious that, though certain constituents may have been diffused throughout its mass, yet the composition of the nebulous material must have differed at different points; otherwise, during the act of agglomeration, each system must have collected and condensed equal proportions of similar materials from the mass around."

"If we may so say (they continue), there seems to be some analogy between this irregular distribution of the elements in different centres in space, and the manner in which the components of the earth's crust are distributed. Upon the earth there are certain very generally diffused elements, such as oxygen, hydrogen, carbon, silicon, iron, aluminium, and calcium, which occur in all parts; whilst there are others which, like silver, tin, lead, and other metals, are accumulated at particular points only. Whatever may have been the physical causes which may have produced this separation, we see abundant evidence of the advantage of this distribution in their application to the *purposes of man*—smallness in relative amount being compensated for by the accumulation of the material indenser deposits, which allow of their comparatively easy extraction to supply the wants of mankind. If this arrangement be admitted as *designed* in the case of the earth, is it going beyond the limits of fair deduction to suppose that, were we acquainted with the economy of those distant globes, an equally obvious purpose might be assigned for the differences in composition which they exhibit?"

Hence there seems to be no little proof, they go on tosay, that, "An *unity of operation* extends through the universe, as far as light enables us to have cognizance of material objects. For we may infer that the stars, while differing in the kinds of matter of which they consist, are *all* constructed upon the same plan as our sun, and are composed of matter identical, at least in part, with the materials of our system."

"On the whole (they conclude), we believe that spectrum observations on the stars contribute something towards an experimental basis on which a conclusion, hitherto but a pure speculation, may rest, viz. that at least the brighter stars are, like our sun, upholding and energizing centres of systems of worlds, adapted to be the abodes of *living beings!*"

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Those who hear me will gather from these quotations the immensity of the subject matter for thought, brought out in these and similar investigations: but I must hasten on to notice brefly, in concurrence with the request of our esteemed president for last year, Dr. Bull, one or two other matters of astronomical interest, which have been either under observation of the telescope, or under discussion as to cause and effect, within the last year.

When I name the sun spots and their causes; the meteoric ring of November last; the effect of tidal action on the rotation of the earth; the sudden outburst of a world, or star "on fire," for such it literally was; and finally, a suspected change in the condition of the lunar crater, as evidence, possibly, of present volcanicaction in the moon, and as bearing upon the question of a lunar atmosphere; it will be evident to you all that the matter on hand far exceeds the limits of the time at our disposal. I can, therefore, but touch upon some of them, and that in the most cursory manner. This I regret the less with regard to the star "on fire," for it has been admirably discussed by the president of the Astronomical Society in a deeply interesting paper, which appeared in the number of "Good Words" for April last. I will pass, therefore, to the other subjects.

To sum up, as briefly as I can, a connection has been discovered between sun spots and planetary action, especially that of Venus and Jupiter. But, again, I prefer to quote the words of the report:—"The period of recurrence of similar phenomena in the case of sun spots is 19 or 20 months. Evidence points to Venus, as the planet which apparently exerts the most predominating influence, although an influence of other planets, particularly Jupiter, is distinctly traceable.

"The nature of this planetary influence consists in a tendency to produce the maximum of Sun spots on that side of the Sun which is *turned away from the influencing planet;* and on the other hand, in a tendency to diminish the size of the Sun spots on that side which is turned towards it." So far the report.

It would seem, indeed, a puzzle to connect the action of Venus, not with Sun spots on the side of the Sun next herself, or the obverse side, but with those on the *other*, or the reverse side of the Sun!

But the answer to this puzzle is suggested in the R.A.S. Monthly Notices for March last. A foreign astronomer, M. Hoek, of Utrecht, assumes, and with reason, I venture to think, that the Sun is throughout a fluid, or acriiorm, gaseous mass: that tides are produced in the acriform envelope by the action of (especially) Venus; that by this tidal protrusion of the layers of the Solar atmosphere such layers, or strata, lose more readily something at least of their heat by radiation. In consequence the density of such strata is increased, until, at last, gravity carries them downwards through the underlying layers of fluid or vapour, which are less dense than those above them. The cavities

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caused by these engulfing processes form the spots, which we see so regularly following the prolongation of the "radius vector" of Venus. Such is M. Hoek's theory of the Sun spots.

Now here I may perhaps claim your courtesy for a very few words, on a subject somewhat similar to this tidal action produced by Venus. I mean the ordinary explanation (even by so recent an author as Guillemin, in his beautifully illustrated work *The Heavens*), of the cause of the tides on the *reverse* side of the earth, or that turned away from the moon. I have long been convinced in my own mind that the ordinary explanation needs revision, and before I read M. Hoek's letter, on that kindred subject, I had explained it to myself thus: Matter, when free of motion as to its atoms, such as water, sand, &c., has *atendency to range itself in a line in the direction of the strongest attraction.* Let us apply this law to the case in point. The tide produced by the moon (or sun in a less degree), on the *obverse* side of the earth, or that immediately under the source of attraction, is manifestly in obedience to this law. Why not so, on the other, or *reverse* side of our planet? For, which is the line of strongest attraction? Surely that of the moon's "radius vector" continued through the earth's centre, and prolonged onwards into space. As a *fact*, the *waters of the ocean by gravity seek that line*, and it is this simple agency which has escaped detection, in the olden theory of the tides.

But I have now trespassed far too much upon your patience. It will suffice, therefore, to say, in regard to the other subjects I named, that the evidence is not yet quite complete as to the supposed alteration in form of the Lunar Crater, "Linnè." A partial obscuration of the latter, for a time, by a "whitish cloudy patch" (for so speaks the R.A.S. report), would go far to prove the existence of something at least of a lunar atmosphere. Time will doubtless bring with it more evidence for future conclusions on this subject.

The action of the tides, as affecting, in an infinitesimal degree, the rotation of the earth, seems now accepted as a theory; but (to quote the report again,) "that the whole of the outstanding quantity of lunar acceleration is due to this cause, is perhaps still an open question."

It now remains for me to thank the members present of the Woolhope Field Club for thus so patiently listening to a somewhat long, I trust not tedious, digest of matters of present interest in astronomy. I venture to express a hope that such and similar subjects of thought and discussion, akin and parallel to, though not immediately identical with our ordinary special study, may not be without their interest and advantage.

Of one thing I am certain, that all such studies of the marvellous works of the Great Creator carry with them their own reward, and that of the many truths which touch the heart and mind, uttered by one who loved our lovely Wye (here close at hand), none is more true than that embodied in the noble poem of which our river is the special theme, that

> Nature never did betray
> The heart that loved her.

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Mr. Weare concluded his deeply interesting address amidst the grateful applause of all present.

The PRESIDENT said he felt sure he was only expressing the feelings of all around him, when he begged Mr. Weare to accept their best thanks for his learned and able paper. It was a paper to be remembered. It did not merely record facts with which they were familiar, but it suggested trains of thought which they might follow out afterwards with pleasure and advantage.

J. LLOYD, Esq., of Huntington, said he thought it might add to the interest of their proceedings if he mentioned that the names of the spot on which they stood, and of the stream that flowed beneath were, like all Welsh local names, remarkably significant. Craig-y-pwll-ddu, or the rocky steep of black pool: Bachoy, Bachowy, Bachhoyw-wy, little, rushing stream or water. What could be more descriptive?

It was now necessary to think of returning. The time had expired. The baskets, once emptied, had many of them been re-filled, this time not with savoury viands, but with geological and botanical treasures. The fern-hunters had been especially successful, and carried off with them many roots and specimens.

And here it should be mentioned that one of the party had been fortunate enough a few days before to find the rare *Asplenium viride* on a part of the Black Mountain, where it had not been before noticed, on the rocks near the top of the most northerly point, called Lord Hereford's Knob, a few hundred yards on the Radnorshire side.

After loitering a short time on the banks of the Bachowy, where they encountered the only slight shower of the day, the party at length assembled once more on the temporary platform to await the train, which stopped specially for them, as it had done in the morning, and left the scene of their day's pleasure about six o'clock.

The meeting at Craig-y-pwll-ddu must be recorded as a very successful day in the annals of the Woolhope Club; and it will ever be a bright spot in the memory of all who were present—all the brighter, perhaps, since it seemed so little likely at one time to be fine.

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THE REMARKABLE TREES

OF

HEREFORDSHIRE.

"THE MONARCH," HOLME LACY.

(Quercus sessiliflora.)

This noble, well-balanced tree, stands on the ridge of Holme Lacy Park (Sir Edwyn F. Scudamore Stanhope, Bart.) The circumference of the bole at 5ft. from the groud is 21ft. 10in. The exact height, by Mr. Well's Clinometer, is 97ft. 6in., and the diametric spread of its foliage is, north and south 102ft., and east and west 97ft. The tree is now rather past its prime. A swarm of bees has located itself in one place; fungus appears here and there on the trunk; and two or three small boughs are broken off.

Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.

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The Woolhope Naturalists' Field Club.

MEETING AT CRAVEN ARMS FOR CLUN.

AUGUST 6TH, 1867.

The fourth field meeting for the year was held on Monday, the 6th instant. The Woolhope Club accepted an invitation from the Caradoc Club to meet the members of the British Archæological Association on a visit to the Bury Ditches and Clun. Again the weather was not promising. The President, Chandos Wren Hoskyns, Esq., Arthur Armitage, Esq., the Revds. James Phillipps, J. H. Jukes, John Raven, and H. J. W. Stillingfleet; Dr. Bull, J. E. Lee, Esq., (Caerleon), and Mr. E. A. Lee, R. D. Harrison, Esq., C. J. Martin, Esq., and Mr. Thompson, met at the Barr's Court Station, and elected the following gentlemen as new members:—Capt. Hereford (Sufton Court), and the Rev. H. J. W. Stillingfleet (Clehonger); and transacted the other business of the Club. At Leominster they were joined by the Rev. James Davies, of Moorcourt, and Mr. J. H. Davies, and Mr. James Lloyd, of Kington. At Ludlow, Humphrey Salwey, Esq., Vice-President, and Mr. T. Salwey, R. Lightbody, Esq., and Miss Lightbody, and Thomas Blashill, Esq. The list of the Woolhope contingent was completed by the addition later in the day of Colonel Colvin and a party of ladies. The Caradoc members were in great force. There was the President, R. Cholmondely, Esq.; the Revds. J. T. La Touche and Wm. Purton, Vice-Presidents; the Revds. L. Corbett, H. Sandford, F. W. Kittermaster, and two friends, G. Notley, C. Fielding, and a friend, J. Hopton, H. Moss, with two friends, A. Male, J. Gardener, and Wm. Jellicose; F. and A. Pelham, Esqrs., W. Buddicom and three friends, S. Wood, Esq., J. Edwards, Esq., Wm. Smith, Esq., F. Nash, Esq., and the Rev. Donald Carr, Hon. Secretary. Amongst those present to represent the British Archæological Association were Mons. D'Avezac, membre de l'Institute de France, Henry Godwin, Esq., F.S.A., Edward Sevren, Esq., M.A., F.A.S., J. F. Dillon Croker, Esq., F.S.A., Edward Roberts, Esq., F.S.A., Thos. Wright, Esq., M.A., F.A.S, &c., Augustus

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Goldsmid, Esq., F.S.A., G. R. Wright, Esq., F.S.A., and Mrs. Wright, E. C. Darmer, Esq., the Rev. Prebendary H. M. Scarth, M.A., F. R. Southern, Esq., (ex-Mayor of Ludlow), the Rev. George Fyler Townsend, Mrs. Willie, John Leach, Esq., and Miss Leach, T. Sydney Smith, Esq., and Miss Smith, Mrs. Hutchins, Miss Hodson, and numerous other ladies and gentlemen who have accompanied the association during the Ludlow congress. The general rendezvous was the Craven Arms, and the confusion here in the matter of carriage conveyance was heightened by the fact of one of the carriages having broken down on the road, "our great drag, sir, what wud hold more nor any on em." The perfect good temper and politeness of the Rev. J. D. La Touche, who by common consent was looked upon as consoler general, was however quite equal to the occasion, and somehow or other the carriages, when loaded to their very utmost, were allowed to proceed.

The weather, which was threatening, and occasionally something more, did not display to the best advantage the fine bold scenery of the route. In spite of the grey sky, however, and the lowering clouds that hid the distant prospect, the striking alternations of hill and valley, seen by most of the party for the first time, gave a high idea of the beauty and almost the grandeur which many parts of the prospect must possess when seen under a more favourable aspect.

At Clunton the carriages were abandoned, and the route was directed towards the Bury ditches, a distance of fully two miles, under the guidance of W. W. Morris, Esq., of Clun. The road up the hill led past the Gunridge quarry, and here Mr. La Touche poiated out to the visitors that it was a quarry of the upper Ludlow rock, and showed well on its surface the characteristic rounding off of the Silurian rocks from exposure to weather. The rock peels off like the coats of an onion, to which it had been compared. At the upper end of the quarry the slaty cleavage was well shown. For want of limestone in the neighbourhood this rock is quarried for road material, and miserable metal it makes, for it quickly turns to mud. There are very few fossils to be found in this quarry, indeed, only an occasional Orthoceratite. A small portion of one was knocked out at the time by one of the gentlemen present, and was thought to be the *Orthoceras Ludense*.

R. Lightbody, Esq., almost doubted whether the rock was upper Ludlow, and thought if it was, it must have been deposited at the bottom of a very deep sea.

J. E. Lee, Esq., remarked that the peeling onion-like character was well shewn in a similar manner in the Silurian rocks exposed near Cardiff.

After this slight halt had been made, the ascent was continued, and on arriving under the shelter of the very fine spruce firs, which grow luxuriantly on the "ditches," it was evident that the news of the intended visit had been spread far and wide. Here were ladies on ponies and donkeys, expectant clergymen, and every representative of the native population, from the sturdy yeoman to the ragged little urchin, who was ready to do anything for the smallest coin of the realm, from standing on his head to picking whortleberries.

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The Bury Ditches are situated at the summit of a considerable hill of steep approach, though by no means precipitous. These deep ditches or trenches, with lofty embankments between them, surrounds the hill top and inclose an elliptical space of ground of some three or four acres extent. The different ramparts vary from about twenty to fifty feet in height, and judging from their precipitous sides at this time, and their perfect preservation, they must have stones in abundance mixed with the earth that forms them. To make these ramparts, enclosing as they do, so large a space of ground, must have been a work of prodigious labour, and the result, most certainly, is a fortification of amazing strength. They are difficult of ascent even now, grass grown as they are, and covered with fir trees. In their original state they must have been well nigh impregnable. Here, collecting by a whistle the crowd of visitors to a favourable spot, the President of the Woolhope Club, Chandos Wren Hoskyns, Esq., introduced Mr. Thos. Wright to them, and told them that they would be well rewarded for their toilsome ascent, by the description he would give them of the interesting ground on which they stood.

REMARKS ON THE BURY DITCHES.

Mr. WRIGHT then said that the real character of such monuments as they saw before them was but little known. It was a subject that required close examination and a general comparison with similar works, before it was possible to give any trustworthy opinion about them. Remains were sometimes found about such monuments, which gave a clue to the age in which they were formed, or used; but here, so far as he was aware, nothing had been found, and therefore their character and history were very uncertain, and almost a matter of conjecture. There was one point, however, of very great importance with reference to encampments of this kind, which had been shown by the Emperor Napoleon III. in his "Life of Julius Cæsar" (the English translation of this work be it added was made by the lecturer). Whilst engaged in writing this work, Napoleon sent some of the most eminent engineers and surveyors to visit and examine thoroughly all similar monuments in Gaul, which could bear any relation to Julius Cæsar, and they arrived at a very decided conclusion; and it was this—that the Gauls did not make entrenchments before the invasion of the Romans. They did not understand the construction of an inclosure with a regular vallum and ditch. The Gauls, before Cæsar's time, certainly threw up the earth as an embankment, mixed with stone and earth, and a hollow was left where the earth came from, but they did not make the ditch a part of their defence. It was not until Cæsar's sixth expedition that they imitated the Roman method of making a fortified camp. Now, if such entrenchments were not used in Gaul, it is not at all probable that they would be in Britain, where, as a matter of course, the inhabitants would be more behindhand. He had examined these earthworks since, and from their bold and perfect condition, he was of opinion that they could not be older than the Roman period. They might even

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be Roman, for it is now well known that the Romans made elliptical camps as well as square ones. There were, however, no authentic Roman monuments similar to this one, and this, therefore, was very doubtful. If not a Roman work, what is it? He considered it to be Saxon, of the very early period of the Saxons. He believed it to be—not a camp—but the house of a Saxon chieftain of great importance, dating probably from about the sixth century. It was the Saxon method to build a wooden house on some elevated position, and make a large inclosure, protected by a regular vallum and ditch, to defend it from attacks without. The great strength of the inclosure here, would be explained by its being so close on the borders of Wales, and therefore very liable to attacks. Saxon entrenchments show no remains of houses, for the reason that they were built of wood, but if the ground beneath were examined, a foundation of stone might be found. At a former visit he had privately suggested the probability of their existence here, and he had since then heard that Lord Powys' game-keepers, in digging for rabbits, had found some stone foundations in the centre. There would also be a paling on the embankments, and space for the watchman to make his rounds. Time did not permit him to enter further on the subject of fortifications, and he would only add that there were numerous instances of smaller houses built with intrenchments, and he might even say that the representation existed to-day in the cottage with its paling or garden hedge.

The time was very short, and no discussion was attempted; if it had been there is no doubt but that very different views would have been elicited—views giving a much higher antiquity to these very remarkable works. The general impression amongst the visitors seemed to be that it was a British encampment of very early date, and possibly one of those made by the army of Caractacus. The broad fact of the frequent existence of such camps in all the districts occupied by the original inhabitants affords in itself a strong probability of their being truly British strongholds. This conclusion is very much strengthened also by the presence of fortifications of a different construction opposed to them, where we know from history that a series of battles were fought. These latter, moreover, bearing well known characters of their foreign origin. The very great strength of this entrenchment was thought to be due to its outlying position.

A general move was now made across the trenches to get to the outer edge of the fir trees, that as much of the magnificent view of the surrounding country might be seen as the rain would permit.

R. Cholmondeley, Esq., President of the Caradoc, introduced the Rev. Wm. Purton to the company, who had very kindly undertaken to give them a description of the leading

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GEOLOLGICAL FEATURES OF THE DISTRICT.

Mr. PURTON then said: I have been requested to point out to you the principal geological features of the landscape now before us, but I fear I shall be but a blind guide, as I was never here before; and there is so much mist that many of the most prominent objects are very obscurely visible. We are placed in the centre of a typical district; for in the immediate neighbourhood of the hill on which we stand we may find rocks representing almost every member of the Silurian system. An ideal section of the district would show an anticlinal axis of those Cambrian rocks which, until recently, were supposed to be the oldest sedimentary rocks in Great Britain. Thrown off on either side by this axis, we have resting, one upon another, in ascending order—First, the Lingula flags; next the Llandeilo formation; then the Llandovery and Caradoc rocks—are overlaid in their turn by the Wenlock and Ludlow group; then the 8,000 or 10,000 feet of Old Red Sandstone, the uppermost beds of which are overlaid by the varied strata of the Carboniferous system. In the great ridge of the Longmynd which you see opposite, towering through the mist, you have the axis I have spoken of, composed of those green and purple slates—those ancient grits and conglomerates which Sir Roderick Murchison was the first to prove identical with the Cambrian strata, though formerly supposed to underlie them. Against these Longmynd or bottom rocks, which are much upheaved and contorted, rest on the N.W. the Lingula Flags, consisting of black shales with Linguloe and a few Trilobites overlaid by those quartoze rocks which form the peculiar castle-like masses which you see rising up here and there along the crest of the Stiper-stones. The Stiper-stones ridge, in fact, represents, in this neighbourhood, the Lingula Flags series. On the N.W. slope of this ridge we find the Llandeilo rocks, which occupy the whole of the mining district of Shelve, and are curiously interstratified with their bands of Volcanic rocks of the Felspathic group, probably the result of successive irruptions of submarine volcanos. The Corndon hill, which rises so boldly a few miles to the N. of Bishop's Castle, occupies the centre of this district, and is composed chiefly of greenstone. You see it yonder amid the mists, the highest point to the north. The country to the N.W., including the spot on which we stand, is occupied by the Wenlock and Ludlow series—the characteristic limestones of which are, however, wanting. The Llandovery rocks are represented by a small patch to the N. of Bishop's Castle, and another at Linley and Norbury. The Caradoc series is nowhere visible on the surface. On the other hand we shall find the whole of the Lingula Flags and Llandeilo rocks absent on the S.E. of the Longmynd ridge having been faulted down: while the Llandovery rest immediately upon the Cambrian along the base of the hill on the south and east. The Caradoc sandstone overlies these, and occupies the district in the centre of which rise the igneous masses of Magleth and Hope Bowdler Hills, the Caradoc, and Lawley. These all stand upon the line of upheaval, which is marked by one of the longest lines of fault in the kingdom, running from S.W. to N.E.,—from far

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away in South Wales to the Severn near Cressage, and there bifurcating. The eruptive rocks of the Wrekin, Lilleshall hill, Charlton hill, and Wrockwardine, mark the prolongation of the same line in a North-Easterly direction. Overlying the Caradoc sandstone come the Wenlock rocks, forming the line of hills which we see running diagonally across Shropshire, from the Severn at Coalbrookdale to Ludlow, in a direction exactly parallel to the line of fault I have described, and also to the ridges of the Longmynd and Stiper stones. On the S.E. slopes of Wenlock Edge lie the Upper and Lower Ludlow, separated by the Aymestry limestone, which is well developed at View Edge, near Stokesay, but thins out towards Wenlock, sometimes appearing as two thin bands parted by shale. The highest beds of this series, comprising the celebrated Ludlow bone-bed and the Downton sandstone, form a group of "passage beds," connecting the Silurian system with the overlying old red sandstone. This formation covers the whole of South Shropshire between Wenlock Edge and the Severn, and rises to a considerable height on the Clee-hills, where it is capped by two remarkable patches of coal strata, which seem to have owed their preservation from the denuding power which has swept away most of the coal strata of the surrounding district to the covering of basalt, which has at these points been erupted through and overflowed the coal measures.

I should mention that at Farlow, on the other side of the Titterstone Clee-hill, at the top of the Old Red series occurs a yellow sandstone, which is supposed to be the equivalent of the Dura Den beds in Scotland, in which the *Pteric thys* occurs. Farlow is, I believe, the only locality in England in which the *Pteric thys* has been found. To the north and west of Wenlock Edge—the Old Red beds have been broken up and denuded by the vast ice-blocks which seem to have drifted from the north—leaving only a few patches, the chief of which occur on the hills of Clun Forest, immediately to the west of us.

I fear I have not been as lucid in my explanations as I could wish; but the weather had made so many of the principal points unusually obscure, that I trust any obscurity in my remarks will be excused on the score of the difficulty of describing what ought, but cannot, be seen. We are sometimes wont to boast that England is the world in little—and the prospect from this spot embracing hills and rocks, which contain the records of well nigh every epoch in the great Palæozoic era, and representatives of almost every member of the Silurian, Devonian, and Carboniferous systems, may surely be considered as going a long way to prove that geologically speaking, at any rate, that boast is true."

After the applause with which the address was received had subsided,

The Rev. J. D. La Touche said that he would supplement the very able remarks of his friend Mr. Purton, by calling attention to an important stratum, upon which he had touched but slightly,—the Llandovery rocks. This stratum is extensively exhibited in this neighbourhood, and is well marked both by its

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fossils and the position it holds in the series of rocks. It has been deposited here subsequently to very great changes of level, and enormous periods of denudation. This is shown by its almost invariably lying unconformably on a subjacent strata. All the formations which lie west of the Longmynd preceeded it. The Longmynd itself, computed at 26,000 feet thickness of rock; the Lingula flags, probably 1,000 feet; then the Tremadoc slates, supposed by Professor Ramsay to have a thickness of 6,000 feet in Merionethshire; and lastly, the Lower Llandovery rocks. When these had all been deposited, upheaved, and denuded, the Llandovery stratum, of which he was speaking, had been thrown down on the sea bottom. The Tremadoc slates is the only stratum in this series which is not shown in the country before them. Portions of the Llandovery rock are found in various parts of this district, occurring in patches, which have resisted the forces to which the whole has been subjected. But the most striking portion is that which clothes, as it were, the slopes of the Longmynd, dipping away from that mountain at a tolerably equal angle, on the West towards the West, on the South towards the South, and on the East towards the East. This arrangement can only be accounted for on the supposition that the Longmynd was an island standing out of the primeval sea, and that these Llandovery conglomerates were formed from the debris of pre-existing rocks, and cast down on its slopes under water. There was one other point he would also mention, and that was the red beds below the Caradoc rocks. It would be very interesting to ascertain with certainty the nature of these red beds. There were some doubts as to whether they were Caradoc or Cambrians. It is not easy to correlate these rocks accurately in a country so much faulted as this is. The conglomerate at the end of Longmynd is certainly like that which occurs at Whartle Knowle, near Hopesay.

After the conclusion of the address and remarks upon it, these very remarkable Ditches were again inspected and crossed with considerable difficulty. The rain had been falling continuously for some time, and the visitors wound round the hill under the guidance of Mr. Morris, through the open heathery ground to the road leading to Clun. It was much too wet to attempt any close examination of the botanical peculiarities of the district. With the kind assistance of Mr. Morris, however, the fern hunters met with the lobed variety of the prickly shield fern, *Polystichum aculeatum, var. lobatum*, in two localities, and with the oak fern, growing in the ditches. The Lamb's lettuce, *Fedia olitoria*, was also gathered, and, rarer than all, the wild clove pink, *Dianthus caryophyllus*, was gathered in a rocky lane about a mile above Clun. The nodding bur-marigold, *Bidens cernua*, might also have been gathered, it was said, had the weather been more favourable. Thus the way down the long lane to Clun, full three weary miles, was pleasantly beguiled, and the travellers were not sorry to reach the town. A tent had been erected on the Castle-green—the tilt yard of olden times—and provisions made by mine host of the Buffalo for the proper entertainment of his numerous hungry visitors.

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In the absence of Mr. Cholmondeley, the President of the Caradoc Club, Mr. Chandos Wren Hoskyns presided. There was only time, however, after the repast to give the thanks of the meeting to the able lecturer of the day, which was done with a pleasant allusion to the ample scope for the differences of Archæologists and their necessarily interminable nature.

The Rev. Mr. La Touche then distributed specimens of the *Astrantia major* to such members as wished for a specimen of this rare wanderer, which has become naturalized in the woods near Stokesay Castle.

The visitors afterwards set off to inspect the ruins of the "Garde Doloureuse," to which Raymond Berenger invited Gwenwyn, the Prince of Powys, as described in "The Betrothed" of Sir Walter Scott, "A place strong by nature and well fortified by art, which the Welsh Prince had found it impossible to conquer, either by open force or by stratagem, and which remaining with a strong garrison in his rear, often checked his incursions, by rendering his retreat precarious." Its situation is well given in the novel, "The River, whose stream washes on three sides the base of the proud eminence on which the castle is situated, curves away from the fortress and its corresponding village on the west, and the hill sinks downwards to an extensive plain, so extremely level as to indicate its alluvial origin." Clun Castle was built by Fitzalan, afterwards Earl of Arundel, in the reign of Stephen, or in that of Henry III. according to Camden. It was first taken and dismantled by Owen Glyndwr in his rebellion against Henry IV., and a small single entrenchment, a quarter of a mile off, is said to have been raised by Glyndwr as a shelter for his troops during the attack. It was, however, afterwards more completely destroyed by order of the Long Parliament under the vote for "sleighting" certain castles. Its strongholds were blown up with gunpowder. The ruins are particularly interesting, inasmuch as they consist chiefly of the lofty walls of the living apartments, the banquetting hall, and rooms above it. The halves of two strong towers or bastions still hold themselves up loftlily, and masses of masonry here and there prove still how very much ground was formerly occupied by the castle and its precincts.

From the castle away went the visitors to the church, passing the interesting old bridge "a high and narrow combination of arches of unequal size over the river Colune, or Clune." Oh, why is not its ancient name retained!

The church is very remarkable. Its massive square tower has a very imposing effect as you approach it. Its architecture, with that of the aisles, belongs to the Transitional period, whilst the eastern end is pure Norman. It has an internal clerestory and several other architectural peculiarities. It must have undergone many alterations at an early period; of late years it certainly seems not to have been much interfered with. Its pillars and walls lean in all directions, and the whole building calls loudly for restoration, and so, too, does the Lytchgate at the churchyard entrance, which is so visibly crumbling away.

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Times are strangely altered in the valley of the Clun. The scenes of strife and bloodshed, of rapine and plunder, which befel this border district in olden times have been replaced by a profound repose for ages past, until now the popular distich runs—

"Clunton and Clunbury,
Clungunford and Clun,
Are the quietest places
Under the sun."

The town of Clun itself still has some 1,100 inhabitants, with room for more. If the Flemings were ever here with their cloth factories, they are gone in spirit as in fact. To a casual observer but little life or energy seems left in the place. It has an air of listless decadence. It lives only in the past, and is fitly represented by the ruins of its interesting castle and the dilapidated state of its fine old church.

But the carriages were waiting at the Buffalo, and a rapid journey back to the Craven Arms enabled the different railway trains to swallow up all the travellers and carry them off in divers directions.

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The Woolhope Naturalists' Field Club.

MEETING AT HEREFORD FOR WOOLHOPE,

AUGUST 27TH, 1867.

This, the fifth and last field meeting of the year, was appointed to be held in the home country, in order to visit the Woolhope valley of elevation, from which the club takes its name. Sir Roderick Murchison has given this valley a world-wide repute. Since he first read aright the true position in nature of the Silurian system of rocks, the Woolhope district has become classic ground in geology. Nowhere, in so short a space, are the upper Silurian strata seen to greater advantage. The volcanic power, enormous as it must have been, which broke through the Old Red Sandstone of Herefordshire and thrust up the rocks beneath, yet seems to have acted in a comparatively limited district, so that a walk of three or four miles will take you completely across this very interesting valley. It is one of the most remarkable geological districts in Great Britain, and it ever will be so. It offers an endless field for study. If the direction of the force which threw them up is known—if that force itself was volcanic—what has become of the Old Red Sandstone and other, layer upon layer, of rocks which originally covered them? How have they been removed? or, in geological terms, what has caused the denudation? Were the strata thrown off at once by the power which threw up the rocks beneath? Did the waves of an earthquake sea wash them away, or did huge glaciers carry them off; or, again, has their removal been the slow and gradual work of countless ages? These and many similar questions agitate the world of philosophy to this day, and in all probability will long continue to do so. It is a district which must always be interesting to visit, and many of the junior members of the club, who had this season rambled far and wide on previous excursions, looked forward with much pleasure to this meeting.

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A goodly number of gentlemen assscmbled punctually at the Barr's Court station, and after electing Thomas Llanwarne, Esq., of Hereford, and Mr. J. B. Downing, of Holm Lacy, as new members; and transacting some other preliminary business; they started by the 9.40 a.m. train on their short trip to Stoke Edith station.

The morning was bright and sunny, and the atmosphere clear. A light breeze, just tinged with an autumnal feel, tempered the brightness and heat of the sun. At Stoke Edith lodge a few ladies and gentlemen joined the party. Availing themselves of the kind permission given by Lady Emily Foley, all the members and their friends, numbering nearly forty, passed through the park and gardens of Stoke Edith. The garden on the south front of the mansion presents that very great difficulty to a landscape gardener of a steep and uniform rise in the ground directly away from the house, and he would be a clever artist who could hit on a better design than Mr. Nesfield has done to surmount it. An arabesque pattern is marked out everywhere, with box edging trimly cut, including many coloured walks, from the white of bright Derbyshire spar to the red of brick, and the black of scoriæ, and here and there the box opens out to receive the flowers which give life to the design by the brightness of their colours. The pattern laid upon the steep grass slope is broad near the house, and gradually tapers up to a point where old Father Time stands with his scythe and his dial. The whole design is graceful and effective—a summer and a winter garden too—for when the flowers are absent, the bright green mazy line of box edging contrasts cheerfully with the coloured walks, and shows out more distinctly still the general pattern. The dial, too, has that well-known significant motto, borrowed, if we mistake not, from the sundial in the square of Verona—

"Horas non numero nisi serenas."

The gardener was in attendance to explain all matters of interest, and he did solve one difficulty for us. He accounted for the presence of the *Anchusa sempervirens*, the Alkanet, which was found growing on the road side near the station. He had cultivated this plant in the garden for the bees, and after the fire which occurred there last spring he removed the broken bricks and debris of the fire to the road side, and with them doubtless the seeds of this plant had been taken. The club now passed out from the private grounds into the deer park. An easy walk led to the summit of the hill, and here and there, when a pause was made, an extensive prospect of hill and dale unfolded itself to view. Looking to the left over Moreton spire, Lady-lift wood and Robin Hood's Butts near Canon Pyon, could be distinctly seen; while in the centre, in the far distance, the Radnorshire Beacon and hills above Kington were visible; and on the right the Clee Hills could also be distinguished. As the visitors ascended in single file among the high fern, and luxuriant oak trees, a rustling was heard above the roadway, and almost on the head of the leader of the company a startled doe and her fawn leaped forth, wondering at the unwonted intrusion on their forest home.

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On the ridge of the hill, towards which the path led, there is a slight depression, appropriately called "the cock-shut," and here, doubtless, long time ago, when

> "Forewarned of winter's iron sway,
> The birds from arctic regions winged their way,"

in greater numbers than they do now, many a woodcock, with his noiseless wings out-spread, would glide through this hollow in the line of hill; and in the glade artificially formed between the woods on either side, the cunning fowler would suspend his net. Then, at "cock-shut time," or that marked hour at even-tide, when poultry go to roost, the birds of night issue forth from their hiding-places, the woodcocks to their feed on the flashes, as the owls to the fields for mice; there would the fowler anxiously watch for the woodcock's flight. The "Cockshut hour" has ever formed a marked time; denoting the close of evening, and the time when all animals, that are dormant in the day time, begin to move. The net-fishermen always make a draft with their nets for salmon at that hour, and if they lose their "Cockshut draft," think they have missed the best hour in the night. Shakspere alludes to the cockshut hour as a familiar time of the day,—

> "Surrey and himself,
> Much about *Cockshut* time, from troop to troop
> Went through the army."*

On the summit of the hill several maple trees were observed, and from their large size and old growth it seemed possible that they might be indigenous there. A stray fossil or two were here picked up, outlying treasures of the quarry; and here too the botanists eagerly gathered the elegant wood vetch *Vicia sylvatica*, climbing over the bushes and loaded with its pretty white flowers, so prettily veined and streaked with blue. Scott has beautifully described this plant, which for foliage, flowers, or habit of growth is scarcely exceeded by any of our English wild flowers:—

> "And where profuse the *wood vetch* clings
> Round ash and elm in verdant rings;
> Its pale and azure-pencilled flower
> Should canopy Titania's bower."

On the descent through the woods, in the direction of the Dormington quarries, some other plants of interest were found, and the more common ones were flowering in great profusion. The following species grew pretty plentifully along the path side:—*Euphorbia amygdaloides*, *Chlora perfoliata*, *Hypericum pulchrum*, and *Erodium cicutarium*; and later in the day the *Gentiana amarylis* and the less common *Gentiana campestris* were also gathered.

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* Mr. Flavell Edmunds suggests that this etymology will not bear close examination, being based on an accidental resemblance between two different words. The Shaksperian phrase "cockshut hour" may have originally meant the opposite of "cockcrow-time," but it came to be applied to the time of evening twilight, when, as is fully described above, poachers used to hang nets from tree to tree, at particular places, so as to "shut" or stop the way of birds when going to roost. The word *cockshoot*, or *cockshott*, on the other hand, has no connection with birds, but means a spur or shoot of a hill: *cock*, in Saxon names of persons or places, always meaning little: *e.g.*, the names Wilcock, little Will, Adcock, little Adam, Silcock, little Silas, etc. In some parts of England the word *shott* means a nook or angular piece of land, the idea annexed to the word being always that of projection.

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The visitors soon reached the extensive quarries of Dormington, where numerous specimens of the characteristic fossils of the Wenlock limestone rewarded the search of the geologists. Here it was a matter of great regret that very few of the older members of the Club were present to point out the peculiarities of the quarry, to name the many fossils found, and to answer the numerous questions which were vainly asked by the younger members; and whilst we are grumbling, we may as well say also that we missed very much to-day, the decision which usually characterises the movements of the Woolhope Club. A good leader is all important across country, he saves members the trouble of thinking for themselves, and leaves every one free to observe the things before him. With confidence in your leader a mistake now and then is better than being always right, as the reward of perpetual doubt. We beg the President's pardon, however, since he was unavoidably prevented until later in the day from joining the Club. It was his own loss, with such glorious weather, and in such a beautiful district, to grumble at all was a difficulty, and not to enjoy the day was happily impossible. At the Dormington quarries fossils indeed were plentiful enough. So abundant were the corals and madrepores that one seemed to stand in an ancient bed of the sea, surrounded by coral reefs. A fine specimen of the *Strophomena euglypha* was found, and a great variety of others with equally difficult names doubtless, if anyone would but have told them. These quarries were long extensively worked, and the limestone burnt in the adjacent kilns for the supply of lime to the country. It is probable, that half the city of Hereford, and the Cathedral itself, were built with lime from these rocks. This limestone, however, only yields an inferior quality of lime, and hence on the formation of railways in the district, and the introduction of lime from Howle Hill, near Ross, and more recently from Pontypool and Gilwern Mountain, near Abergavenny, these quarries have been abandoned. Descending through the woods to Checkley Green, a halt was made, and it was determined to visit the quarries, on what was formerly Checkley Common. Nothing was, however, found there to repay the short but fatiguing walk, in the now broiling sunshine. On the return a second halt of more agreeable nature was made. The Rev. F. Merewether had kindly sent here a good supply of bread and cheese and cider, which cheered the spirits of all.

After this repast a discussion arose as to the rest of the proceedings of the day. Backbury Hill rose temptingly before the eyes of the excursionists; and the day was one preeminently fitted for seeing extensive views. It was known that one of the most extensive and varied views in the county was within reach, and it seemed a pity to miss it. About three-fourths of the party resolved to give up the quarries for the sake of the hill. Leaving the quarries by a picturesque path across some upland pastures, they came out on the common, up which their path lay to the summit of the hill. They were well repaid for the toil of the ascent. Every step upwards opened out a wider view; and when they reached the summit the whole panorama lay spread out before them in marvellous

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distinctness and beauty. The breeze was fresh and pleasant; the atmosphere very clear, and the turf studded with blossoms.

The summit of Backbury Hill is crowned by an ancient entrenchment, planted thickly with wood. Outside the wood a narrow path winds round the enclosure. At every step

> "The eye hath caught new pleasures
> As the landscape round it measures."

The hills about Ross and on the verge of the Forest of Dean were distinctly visible, and marked out by faint clouds of smoke rising from the coal-works. On the Welsh border rose the long line of the Black Mountain, at the left of which the mountains about Abergavenny, distinguished by their curiously abrupt and pointed outline, were in full view. The plain below, intersected by the Wye, and dotted in all directions with corn-fields in all the glory of harvest, was lighted up by gleams and patches of sunshine, far more picturesque than if an unbroken blaze had made it all equally conspicuous. The most distant points visible were to the North, where the hills about Church Stretton were above the horizon.

The travellers lingered for some time on the breezy height, and then wound their way down to Mordiford, where the rest of the party awaited them. Those who adhered to the programme went to visit the quarries at Scutwardine. Here the true Woolhope limestone is found. These quarries are now extensively worked, and the stone brought from them is used for the repair of the roads in the district. Several trilobites and other fossils were found, for whose pleasant and euphonious names we beg to refer the gentle reader to the quarto edition of Murchison's Siluria, where will be found also the portraits of most of them. Both divisions again met at the appointed trysting place, the Moon at Mordiford, that pretty village near the confluence of the Lugg with the Wye, or, as Drayton has it, "The wedding of the lovely Lugg with the princely Wye," and in less than an hour the whole party were safely brought back in carriages to the City Arms Hotel at Hereford, where the dinner had been provided, and was thankfully discussed.

We will take advantage of the interlude to give the names of the members and visitors who took part in the day's proceedings:—The President, Chandos Wren Hoskyns, Esq.; the Rev. Thos. Woodhouse, vice-president; Rev. Geo. H. Cornewall, hon. sec.; Rev. Henry Cooper Key; R. Hereford, Esq., and the Rev. R. Hereford; Rev. W. H. Purchas; Rev. J. F. Crouch; John Lloyd, Esq.; Rev. J. Raven, Master Raven, and Master Tancred Raven; James Rankin, Esq., and Reginald Bushell, Esq.; Dr. Bull; Rev. E. Du Buisson; Rev. H. W. Phillott; J. Hullah, Esq.; Rev. Thos. Phillipps; Rev. T. B. Beavan; John Llewelyn, Esq.; Rev. Thos. West; Rev. J. H. Jukes; James Best, Esq.; Rev. R. W. Williams; James Davies, Esq.; Rev. J. C. Westropp; Rev. H. J. W. Stillingfleet; Capt. Pateshall; Powell Price, Esq.; J. H. Wood, Esq.; Mr. Henry Southall; Mr. James Lloyd; Mr. Pitt; Mr. With; and Mr. Arthur Thompson, the assistant secretary.

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When grace had been said, and the cloth removed, the President rose. It might seem ominous to begin with the expression of a regret, he said, but he must do so nevertheless, for he could not help regretting very much that this was the last of their pleasant meetings for this year. The interest of these field days never seemed to grow less, and it was a matter of great congratulation that the position and prospects of the club never stood higher than at the present moment. The best test of this success was the publication of the volume of Transactions for last year, a copy of which they had all received. He did not hesitate to say, that it would be a credit to any club to publish a book so full of varied information and instruction on the natural science of the county (hear, hear). Quite independently of the enjoyment of these meetings, it was most satisfactory to get so good a volume at the end of the year. So far as his experience went there were very few societies, learned or otherwise, whose subscription was so amply repaid (hear, hear). The many papers it contained were so replete with interest, and embraced so many subjects that, to any one with a love for any branch of natural science, it must prove a source of gratification (hear, hear). For his own part, he thought the subject of the Remarkable Trees of the county was particularly interesting. It was a happy idea to give an exact account of the present condition of their finest forest trees, and to illustrate them by photographs. Last year they had illustrated the yew trees of this county, they were now about to commence the oaks. The honorary secretary, Mr. Cornewall, would read them a paper "On the Oak Tree in Herefordshire" at the annual meeting, and he should have presently ask to them to authorise the central committee to have photographs taken of three of the finest oaks in the county to illustrate it. If they were pleased with their volume of Transactions it was at once a duty and a pleasure to him to show them they had good reason to be so, by telling them what some of the leading scientific men had said of it.

Sir Charles Lyell writes:

I beg to acknowledge the receipt of the transactions of the Woolhope Naturalists' Field Club, a truly elegant volume, beautifully illustrated, and full of excellent and varied matter.

I regret that I have been unable to attend any of the meetings of the club, although I have had the honour of being one of your honorary members for many years.

I am glad to see that you are making and recording measurements of some of the oldest trees in the county. I remember being much delighted with an essay by the late Auguste de Candolle on the Longevity of Trees by reference to their Size and Rings of Growth, and he ascribed extraordinary antiquity to certain European yew trees, several of them, if I am not mistaken, in British churchyards.

Be so good as to give my thanks to the club, and believe me, your very obliged fellow-member of the Woolhope Club,

73, Harley-street, London, July 16, 1867.

CHARLES LYELL.

Sir Roderick Murchison, in a letter to the Rev. Wm. Symonds, begs him to be his spokesman at the next meeting of the Woolhope Club, to express his regret that he was unable to attend it himself, and to return his warm thanks for the transmission of the volume of Transactions, and adds: "It quite cheers my old Silurian heart, to see how the noble valley of elevation of Woolhope has been

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glorified so as to embrace the botanical districts of Herefordshire in its name," and he goes on to say, what is of much interest to our club:

> In my new edition of "Silurla" you will find that I make the clean sweeping out of the Woolhope Valley a stronger argument than ever against slow and ordinary causes of such a denudation. Whilst the true order and succession of our older formations is now well made out, I see little that is stable in the explanations of superficial detritus; and I feel confident that the theory of kingdom glaciers (universal?) is far too wild and untenable.
>
> Wishing you a merry and instructive meeting, I am, ever yours sincerely,
>
> 16, Belgrave-square, July 17, 1867. ROD. I. MURCHISON.

Then, that eminent practical geologist, Mr. Etheridge, thinks so highly of it, that he requested a copy might be sent to the Library of the Museum of Practical Geology in Jermyn-street, and I hold in my hand a letter conveying "the best acknowledgments of my Lords of the Committee of Privy Council on Education on behalf of her Majesty's Government," for the copy which was sent there. Without troubling you with the polite remarks of more ordinary people, I will only add that the acknowledgments of the other Naturalists' Field Clubs to which it has been sent, have been accompanied almost unanimously with an expression of warm congratulations on our being able to bring out so goodly a volume. I will now ask the Honorary Secretary to show you the rare Herefordshire wild flowers he has brought with him for the purpose.

The Rev. Geo. H. CORNEWALL said he had brought some plants both living and dried, which he thought would interest them. The first he would direct their attention to, was a pot of the *Wahlenbergia hederacea*, the pretty little ivy-leaved bell-flower. It was one of the most elegant and graceful of our wild flowers. He had grown the plant as they saw it for two years, having dug it up with the turf at Moccas, and he believed it did not grow anywhere else in the county.

The Rev. R. H. WILLIAMS said that it grew also on an outlying part of Herefordshire on the Clee hills.

Mr. CORNEWALL then exhibited in a pot a very fine grown specimen of the Holly Fern, the *Polystichum Lonchitis*, which he had gathered himself on Ben Lawers and had since grown it in his greenhouse without difficulty. He brought it to show them how very distinct its characters really were, and how little resemblance there was between it and the *Polystichum lobatum*, which some people fancied the same thing. The dried plants he had brought were from the Moccas Park pool. They were the *Ranunculus lingua*, the greater spearwort, and the *Utricularia vulgaris*, the great Water Milfoil, or Bladderwort. He did not think either of these plants grew in any other district of the county, and he had brought specimens of them in case any gentleman wished to add them to their collection. The *Utricularia* grew very plentifully in the pool this year, but it was some years now since he had been able to find it there.

Dr. BULL said it was a great pleasure to himself and to all the botanists present to see so many rare Herefordshire plants. He thought Moccas must be a very favoured district. He was also happy to be able to introduce to them another plant new to Herefordshire. They had long sought in vain for the

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flowering fern, the *Osmunda regalis*, in this county. He was happy to say that it had at length been found, and the specimen he then exhibited was a true Herefordshire production. In these fern-loving days they would be glad to know where to find it, so he would tell them that if they left the city in a north-westerly direction, and went far enough (laughter), and looked closely enough (laughter) they would see a small bog with alder-bushes growing about it, and there they would find five fine plants of the *Osmunda*, with fronds nearly six feet long, and in another small adjoining bog was one other plant. These six plants were all that grew in the county, so far as he knew. Lest, however, they should think these directions not sufficiently precise (hear, hear), he would tell them that if they took the train to Whitney, and walked on four miles to the Rhos Goch, they would find an abundance of the *Osmunda*, and though these were Radnorshire specimens, they would be equally ornamental in their gardens, and Radnorshire had many other localities for it. Mr. Lloyd, who was now present, had gathered the Herefordshire specimen shown, and could bear witness to its authenticity. He had, moreover, kindly consented to be just as precise as he had been himself in giving them directions where to find it (a laugh). He had also to show them a specimen of that variety of Polypody called *Polypodium Cambricum*, which was also new to Herefordshire, and which Mr. Lloyd had gathered at Lyonshall. In the next place, there were several matters he had to mention on behalf of the Central Committee, whose duty, as they knew, was to carry out the wishes of the Club, and to take its entire management during the Intervals of the meetings. It was a matter of great satisfaction to the Committee that the meetings of this year had passed off without any private entertainments. They felt it to be most desirable in every way that all such invitations should be gratefully declined (hear, hear). As it was, the days were always too short for the work before them, and now that the members had become so numerous the necessity for economising time became greater than ever. They were thankful to be allowed, as they always were, to visit the different estates in the county for the purpose of making their observations, and must studiously avoid causing their visit to be an infliction (hear, hear). As the President had said, the club had began the work of taking a record of the more remarkable trees of the county, and it was proposed every year to have a paper on one or other of the forest trees in succession. Last year Mr. Woodhouse had given them the excellent paper on Herefordshire yew trees which appeared in the transactions, and this year they were to hear Mr. Cornewall's account of the oak tree in Herefordshire. The subject, however, was too wide to be treated in this way with entire satisfaction, and it had occurred to the Central Committee that in addition to these papers, it would be well to have separate accounts of the more remarkable trees of particular estates seriatim—reports that would embrace all the remarkable trees of every kind growing on a single estate—and thus they would make good their ground as they went on in a very satisfactory manner. Now, if any gentleman of the county should be desirous of helping the club, instead of providing a costly entertainment for the members, if he

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would be so good as to help them to draw up this report of his own estate, and to give them some photographs of his favourite trees, to illustrate it, his generosity would indeed be greatly valued. The account of their trees would enrich our Transactions, and be of great interest and utility to them and to everyone as a reference in after years. He mentioned this point the more particularly because their President had frequently during the year expressed the wish to entertain the club at Harewood (hear, hear), and the committee had as frequently strongly opposed it. He hoped, however, that they had now settled their differences in the satisfactory way he had just pointed out. For the President had promised to help them to draw up a report on the more remarkable trees of the Harewood estate as the first of the series, and he had most kindly undertaken to supply them with photographs of the home oak at Harewood, and also of the fine picturesque Scotch fir which stands by the mystic circle in the park (hear, hear, and applause). These photographs had already been taken, and very good they were, as they would see by the copies passed round. Major Peyton had also been kind enough to promise the Club photographs of the noble old oak trees at Colwall for their Transactions (applause). This brought him to the distinct proposition which he would now make: "That the Club should authorize the Central Committee to procure photographs of the Tibberton oak, the old Harewood oak, and the "Monarch" at Holm Lacy to illustrate Mr. Cornewall's paper on Herefordshire oak trees" (applause).

The Rev. H. COOPER KEY seconded the proposition with much pleasure, for it was one that could not fail to keep up the value of their Transactions.

The PRESIDENT then put the proposition to the meeting, and it was carried unanimously with applause. He then called on Mr. Key to read his paper on Funguses.

The Rev. H. C. KEY said that he must premise the remark, that the short communication he had to read to them, was written by Mrs. Key. She had paid great attention to the subject for some years, and he felt called upon to say that her observations might be relied upon.

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ON THE PROBABLE IDENTITY OF AGARICUS GEORGII AND AGARICUS CAMPESTRIS.

By Mrs. KEY (Read by the Rev. H. COOPER KEY).

We who live in the country and are accustomed, in more or less degree, to notice the vegetable productions around us, know that besides the usual eatable mushroom, called by botanists *Agaricus campestris*, or field mushroom, there are very commonly found under trees, near hedges or buildings, and occasionally in open spots in the fields, large, clumsy mushrooms with very thick caps and stems, often stained slightly with yellow, and pale dull pink gills, which at first are almost white; and these, called in botanical books *Agaricus Georgii*, or St. George's Agaric (Hooker) are regarded with much suspicion, and always rejected by prudent cooks, as unfit to eat.

I have observed some facts in the last few years, which make it appear probable that the *A. Campestris* and *A. Georgii* are really one and the same plant, altered by some of those circumstances of habitat, weather, &c., which have so much effect on funguses generally, and as I have never met with any remarks on the subject, I venture to think they may be worth notice.

A few years ago, a ring under a tree, not a hundred yards from Stretton rectory, produced in the early part of summer a crop of these large, thick, pale-gilled Agarics, which the cook of course pronounced unwholesome and useless for the table. Two months later, the same ring produced a second and very abundant crop, but this time it consisted of undoubted and very fine *A. campestris* four to six inches across, thin, slender-stemmed, and with fully-coloured gills. They were cooked without hesitation, and were excellent. In previous and subsequent years, this ring has always borne *A. Georgii* of the most decided type.

Last year (1866), in the same meadow, but in a part far away from any hedge or tree, the reverse occurred: a large fairy ring, hitherto always producing small, highly-coloured and flavoured mushrooms of the best type, was crowded with comparatively small *A. Georgii*, and this variety appeared in a third spot of the same meadow, near a tree, where two years ago very good and fine *A. campestris* grew.

Further, in an adjoining field there grew, five or six years ago, in a ring near the hedge, a very abundant crop of the dark-brown variety of *A. campestris*, with slender stems, and caps quite thin and flat on reaching their full growth; last year (1866) this ring had *A. Georgii* growing in it.

The *A. Georgii* variety appeared unusually plentiful in 1866. I noticed scattered specimens in quite open fields where *A. Campestris* would have been expected, as it more often grows in a detached manner than the so-called *Georgii*.

Every degree of colour and comparative thickness of cap and stem could in September 1866, be found in the same meadow.

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In another county, many years ago, a ring, partly beyond a tree, and partly under its branches, produced mushrooms graduating from the *campestris* to the *Georgii* form at the same time.

These observations seem to indicate that some cause, to us unknown, varies these plants from year to year, and that the *Agaricus campestris* and *A. Georgii*, are really but one species.

As the question of fitness for food is involved in some of their variations, and as mushrooms are now much cultivated, these peculiarities may be worth attentive remark.

POSTSCRIPT.—This year (Sept., 1867,) some mushrooms have grown under a tree, which, thin in cap and slender in stem like *Agaricus campestris*, have the peculiar whiteness of *Agaricus Georgii* (White Caps is its name in Covent Garden market), and turn yellow on being bruised; the gills are paler than in a really good mushroom, but not so pale as in *A. Georgii*, and they have scarcely any scent. They appear exactly intermediate, and are an additional instance of what is said above.

Dr. BULL said they were very much obliged to Mrs. Key for introducing the subject of Funguses to the notice of the club, in the paper which had just been read. Whether the two funguses she had named were merely different phases of the same fungus, he would not pretend to say. He was not quite sure which fungus was meant by the *Agaricus Georgii*. Berkeley and Cook agreed in calling the *Agaricus gambosus* "the true St. George's mushroom." Now this was an early fungus, which appeared in rings at the end of April and May (Saint George's day being April 23rd), whilst the *Agaricus campestris*, or the ordinary mushroom, was an autumnal species, and did not grow so universally in rings. These funguses Berkeley makes not only to be distinct, but he places them in a different genus. From the description given, however, the *Agaricus arvensis* of Berkeley, or *Agaricus exquisitus* of Badham, "the horse mushroom," as it is called from its larger size, is the kind meant, and this kind is called by Withering and Hooker the *Agaricus Georgii*. This fungus is also thought generally to be distinct from the ordinary mushroom, and by some is even placed in a separate section. He had gathered them last year at the same time and in the same field, at Rotherwas, the common small mushroom growing separately, the horse mushroom growing in rings and large clusters. He did not think the fact of different funguses growing in the same ring proved anything very definitely, for they often did so, and when the seasons of the different kinds were not the same, they would of course succeed each other in the ring. Thus the *Agaricus Dryophilus*, *personatus*, and *urens* would grow in the ring of the *Oreades*. Such facts told in favour of there being something peculiar in the condition of the soil in the course of the ring which favoured the growth of funguses. He would not, however, attempt to give any opinion of his own, but would suggest that the observations should be sent to Mr. Cooke, the editor of *Science Gossip* and the author of *British Fungi*.

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He would gladly take this opportunity of bringing the subject of the Edible Funguses of Herefordshire to the notice of the club. For the last three or four years he had paid some attention to funguses, and he had come to the conclusion that they were not only abundant in Herefordshire, but that if the natural size given in the illustrated works he had seen as the average, was correct, they were also particularly fine. He was glad also to tell them that several of the kinds which were excellent eating, were very common in the county (a laugh). He had had pleasant experience of their good qualities, and could safely say that vegetable sweetbread, vegetable lambs' kidneys, aye, and vegetable beef-steaks too, of fungus origin, delicious in flavour, rich and wholesome, grew neglected around them (laughter). He accepted their mirth as that of pleasant anticipation rather than that of unphilosophic disbelief (hear, hear). He spoke from experience, and was now at all times equally ready to gather and bring home the *Agaricus procerus* and *A. deliciosus* as he was the ordinary mushroom. It was really a great pity that so much good food should be lost. The waste was due to the very great prejudice existing against Funguses, which means nothing more than very great ignorance about them. Because some very common funguses were poisonous all except the mushroom were supposed to be so too. Beyond all question there were very poisonous funguses as there were very poisonous plants, but the venom of the bad did not lessen the good qualities of the wholesome. All that was required was the knowledge to distinguish the one from the other. Nobody refused to eat potatoes because they belonged to a family of virulent poisons. We all eat horse-radish, though not a year passes but some families are poisoned by eating scraped aconite root in mistake for it. We use freely common parsley, though the poisonous fool's parsley grows in every garden, and numerous other examples might be given to show the necessity of knowing the good from the evil. According to Berkeley there were about 2,380 different kinds of British Funguses, without including those which required a microscope to distinguish their characters. He only marks ten of these as poisonous and six as doubtful, whilst Dr. Badham in his work on esculent funguses gives forty-eight as edible, from his own experience. The vast majority of funguses, therefore, are quite innoxious, neither poisonous nor edible. It is unfortunate that some of the most poisonous are the most common, for there is scarcely a field, and not perhaps a single wood in the county, that does not abound with several varieties of the *Coprinus*, the *Agaricus fasciculari*s, the beautifully-coloured *Russula emetica*, and several others. Since they are so abundant in the county it is peculiarly the province of the Woolhope Club to encourage the study of Mycology, and thus lessen the prejudice existing against them all, by clearly showing the means of distinguishing which are good and which are bad. This was a matter of some difficulty, for the scientific differences were too minute for ready distinction, and there were no general rules for their guidance without numerous exceptions. They could not be guided by the place they grew in; nor could they eat after slugs, as they did after wasps and birds with fruit, for slugs seemed to enjoy the most poisonous kinds; colour gave no distinction, nor was the smell

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and taste of a fungus an infallible guide. The most practical way of doing this, perhaps, would be to begin with the Edible Funguses, and by presenting to the members carefully-coloured illustrations of some of the best of those which grow in this county, to prevent the possibility of a mistake in their recognition. At the same time, their proper characters could be given in the letter-press, with precise directions for properly cooking them. If, for example, they could this year give good coloured pictures of *Agaricus procerus*, *Lactarius deliciosus*, and *Marasmius Oreades*, he thought they would be highly appreciated by all the members of the club. It would be impossible for them to do this, however, without the assistance of ladies to colour them—that is to say, the club could not afford to pay for their being coloured. The ladies had done much for last year's volume, and were most kindly again prepared to help with this one, so that the committee did not despair of accomplishing it. The illustrations to the paper read, too, were so beautifully drawn and coloured, that if Mrs. Key would be so kind as to help them, an artist in addition would be added to the list, in whose work no failure need be feared. It was, however, no light matter to colour six hundred lithographs, and he hoped that other ladies would be kind enough to volunteer assistance and help with a few of them. The real importance of a knowledge of the characters of funguses will be best shown by a quotation from Dr. Badham's work on the "Esculent Funguses of England." After speaking of the pleasure of searching for them he says: "In such rambles he will see what I have this autumn (1847) myself witnessed, whole *hundred-weights of rich wholesome diet rotting under the trees; woods teeming with food, and not one hand to gather it;* and this, perhaps, in the midst of potato blight, poverty, and all manner of privations, and public prayers against famine. I have indeed grieved, when I reflected on the straightened condition of the lower orders this year, to see pounds innumerable of extempore beef-steaks growing on our oaks in the shape of *Fistulina hepatica*; *Agaricus fusipes* to pickle, in clusters under them. Puff-balls, which some of our friends have not inaptly compared to sweet-bread for the rich delicacy of their unassisted flavour; *Hydna* as good as oysters, which they somewhat resemble in taste; *Agaricus delic osus*, reminding us of tender lamb-kidneys; the beautiful yellow *Chanterelle*, that *Kalon kagathon* of diet, growing by the bushel, and no basket but our own to pick up a few specimens by the way; the sweet nutty-flavoured *Boletus*, in vain calling himself *Edulis* where there was none to believe him; the dainty *Orcella;* the *A. heterophyllus* which tastes like the craw fish when grilled; the *A. ruber*, and *A. virescens* to cook in any way and equally good in all; these were among the most conspicuous of the trouvailles" (page 151).

If the club thought it desirable, the Central Committee would do the best they could to draw up the letter-press to accompany the pictures, and get them properly coloured, with the kind assistance of ladies.

The PRESIDENT thought there could be no doubt about that. It was a very important subject and one that could not fail to do credit to the club, and prove of great utility. He was sure they would wish him to give the thanks of

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the club to Mrs. Key for her interesting paper. He had very great pleasure in moving "that the Central Committee be authorised to spend a sum not exceeding six pounds, in procuring coloured illustrations of the three funguses, *Agaricus procerus, Marasmius oreades*, and *Lactarius deliciosus*, to illustrate a paper on the Edible Funguses of Herefordshire.

This proposition was seconded by the Rev. H. Cooper Key, and carried by general consent.

The Rev. George H. Cornewall thought that some illustrations of the fossils of the Silurian rocks should be given, and would be well appreciated.

Dr. Bull hoped it would not be long before they gave some illustrations of fossils, especially of the Woolhope rocks, but a great number of them had been already figured by Murchison and other authors. If their illustrations were for the present botanical, it must be remembered that whilst the rocks and their fossils had been carefully studied, nothing had before been done for the Botany of the county.

The President then called on Mr. Rankin to read his paper on "The Recent Progress of Zoology."

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REPORT ON THE RECENT PROGRESS OF ZOOLOGY,

By JAMES RANKIN, Esq., Bryngwyn.

Gentlemen of the Woolhope Club, I have been requested to bring before your notice some of the more recent observations in the sciences of Comparative Anatomy and Zoology. As my time is limited to fifteen minutes, it is quite impossible for me to do more than mention some of the many interesting topics connected with these subjects, and to prevent my paper becoming a mere catalogue of scientific facts and theories, I propose to devote ten minutes to the consideration of a subject which has of late been brought somewhat prominently before the Zoological world, and the remaining five minutes to the brief notice of two or three other interesting subjects.

The subject I refer to above is

THE STRUCTURAL DIFFERENCES BETWEEN THE HIGHER APES AND MAN.

In discussing this subject I propose to trace the leading resemblances and differences between man and the gorilla and chimpanzee, from the skull down to the feet, and then briefly notice the conclusions arrived at on the subject by some of the most eminent anatomists.

Skull.—On comparing the skulls of man and of the gorilla, the first thing which strikes one, is the expansion of brain-case in man and the prognathism in the gorilla. The ridges of skull are largely developed in the gorilla and almost absent on the skull of man. This is a point, however, of which too much should not be made, as the skulls of some of the lower monkeys are almost as smooth as the skull of man.

Brain.—The capacity of the brain-case is, however, a point of essential difference, and the brains of man and the gorilla (although structurally similar, that is to say, having the same parts) are very dissimilar in weight, for the brain of an adult gorilla is not half as heavy as the brain of a child of four years old. When the weight of the body of a gorilla is taken into consideration, being nearly twice that of an average woman, this difference of weight is significant, as it shows that, in proportion to the weight of its body, the brain of the gorilla is only quarter of the size of the human brain; or, in other words, if the gorilla and man weighed the same, the brain of the gorilla would be only a quarter of the weight of the brain of man.

Teeth.—Another point of dissimilarity is found in the teeth: these in man are all even and set close together, an arrangement which exists in no other mammal except the extinct anoplotherium. The canine or eyetooth of the gorilla is largely developed, and there is a break or gap in the series in both jaws; in the upper, between the outer incisor and the canine—in the lower, between the canine and the first molar. This development of the canine teeth is found in all the apes, and points very clearly to their bestial relations.

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The order of eruption of the teeth of the apes and man is, I believe, not the same, although the number is the same.

NECK.—Passing on to the neck, we find that man, and the gorilla and all other apes and all other mammals (except the sloth, which has nine) agree in having seven vertebræ, the articulations of which, I believe, are similar in man and the apes; but in man the vertebræ support no spines, which in the apes, especially the gorilla, are very large, in order to give attachment to the muscles which support the head; this arrangement shows that the upright position is not the natural one with the apes.

ARMS.—The anterior extremities of the apes are largely developed and much longer in proportion to the height of the body than in man. In the case of the gibbon they reach to the ground when the animal is standing upright. The bones of the fore-arm are always long and strong, and the fingers are longer and the thumb shorter and weaker in proportion to the size of the hand than in man. Very frequently the arms of the apes are stronger than their legs, and almost always longer; in man the reverse of this is the case. The bones and muscles in the arms and hands of man and the higher apes are the same. In the Orang and lower apes, the carpus has nine bones instead of eight.

SPINE.—With respect to the spine or backbone, the entire number of separate vertebræ is the same in the gorilla and in man; but in man there are twelve dorsal and five lumbar, while in the gorilla there are thirteen dorsal or four lumbar, that is, man has twelve ribs, and the gorilla thirteen. The beautfful "S" like curve in the spine of man is not observable in the spine of the apes.

PELVIS.—The pelvis of man is very different from that of the ape; it is much broader and more expanded than that of the ape, and gives surface of attachment to those large muscles which enable man to maintain his upright position, and is one of the many points in the structure of man which so clearly indicate his exalted posstion in the animal kingdom.

LEGS.—With regard to the posterior members, considerable diversity exists among the apes as to the proportions which they bear to the spine, but generally speaking the legs are shorter in proportion to the spine in the higher apes than in man, and much less muscular in proportion to the weight of the body, another indication that the apes were not intended to be bipedal in their gait.

KNEE-JOINT.—Professor Humphrey, of Cambridge University, has, in the *Journal of Anatomy and Physiology*, shown how the condyle of the femur at the knee-joint of the chimpanzee is almost circular, and that the lateral ligaments attached to it are attached nearly at the centre of the condyle, unlike the arrangement in man, where the condyle is elongated and the ligaments are attached much nearer the posterior than the anterior surface of the condyle, and when the leg is straight all the ligaments are tight, an arrangement eminently conducive to the stability of the upright position. In

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the chimpanzee, Professor Humphrey found that the muscles of the thigh were inserted much further down the tibia or leg bone than in man, and that they did not allow the leg to be perfectly straight upon the thigh without using some violence, showing clearly that the legs of monkeys were not intended to be perfectly straight.

FOOT.—I must now come to the question of the foot, perhaps the most important point in the whole structure for the object of comparison, and the one which the older naturalists thought fit to take as the characteristic of the whole order, calling it quadrumana, or four-handed.

In the foot, as in most other parts of the body, it is by the disposition of the parts and not by any new part that the human foot differs materially from the foot of the apes.

And, first, I must briefly state what are the leading differences between a hand and a foot, taking as our standard the human hand and foot. They are these. In the foot there are seven tarsal bones, in the hand there are eight carpal bones, in the foot there are short flexor and extensor muscles of the toes, and a muscle called the peronœus longus, all which muscles are absent in the hand; besides these differences the big toe or hallux is in man parallel with the other toes, whereas the thumb or pollex is placed at an angle with the fingers, thereby becoming opposable. We must now take the foot of the gorilla or chimpanzee and compare it with the hand and foot of man, and see to which member it bears the most resemblance. As far as bones and muscles go the foot of the ape resembles the foot of man and not his hand; that is, it has seven tarsal bones, the short flexor and extensor muscles, and the peronœus longus, but the hallux or big toe is not set upon the tarsal bones in the same level or the same direction as the other toes; it has much greater mobility than the hallux of man, which is prevented from free movement outwards by the other toes and inwards by a transverse ligament which (according to Humphrey) is absent in the ape. This is a most important diversity of arrangement, as it makes the hullux of the apes as much opposable as the pollex of man, and clearly points out that the posterior extremities of the apes were intended for grasping boughs of trees and other things, and not solely intended, as in man, for a bipedal gait. This fact has a high teleological signification. Other diversities exist; as, for instance, the heel bone or os-calcis in the apes not being placed directly under the astragalus, and therefore not bearing the weight of the body so directly as in man; it does, in fact, approach the condition in which it is found in the lower mammals, where it is merely a lever and point of attachment of the muscles.

The other bones of the tarsus too, in the apes are not so much flattened nor so strong as in man, and are formed more for rotation than for bearing heavy weight. Other differences exist between the foot of man and the apes, but I think I have touched upon the most important.

VIEWS TAKEN BY ANATOMISTS.—It remains now, therefore, to decide from the evidence above, whether we should class the posterior member of the apes as

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a foot or as a hand. If, with Professor Huxley, we look merely at the bones and muscles which are present and disregard their disposition, then, no doubt, we must conclude that the posterior extremity of the apes must be called a foot and not a hand; but, if with Blumenbach, Cuvier, Owen, and many others, we regard the opposableness of the great toe, and the lengthening of the phalange as points which constitute a hand, then, undoubtedly, the posterior extremity of the ape is a hand and not a foot, and the old name of the order is correct. This is the view taken by Prof. Humphrey, for he says:—"Taking therefore this view of the matter, and finding that the modification of the terminal part of the hind limb in the chimpanzee so clearly corresponds with that of the fore limb, we can hardly refuse to the one the appellation which we give to the other. If we call this a hand because its pollex is opposable and its digits long, we have precisely the same reason for calling that a hand also; and the application of the term *Quadrumanous* to the animal is thus justified by real anatomy, as well as by external configuration. There is, I think, clearly no sufficient anatomical objection to it."

The Professor advocates the adoption of the term *Chiropoda* (hand-footed) as a substitute for the term *Quadrumana*, or four-handed.

It would, I think, be a very suitable name for the order, only it is a little too much like the name of the order which contains the bats, *Cheiroptera*, wing-handed.

Thus we see that some of the greatest anatomists, both past and present, have thought proper to separate man from the apes, and make him into a distinct order by himself, called Bimana, or two-handed; and some indeed have deemed him worthy of a distinct sub-class—(see Owen's Classification of Mammalia)—while others, as Huxley, following Linnæus, have placed him along with the higher apes, under the designation of Primates.

For my own part I prefer that arrangement which assigns to man a separate *order*, as his structural peculiarities appear to me sufficient to justify such a classification, though not sufficient to justify the placing of man in a separate sub-class.

I would, however, decidedly express my opinion that, great as the structural pre-eminence of man may be over that of brutes, we must nevertheless look for his superiority not in his physical but in his psychical endowments, which reach their highest expression in those divine gifts of speech and improveable reason.

I must now very briefly notice two or three interesting points in zoology recently brought forward; and, first, I would notice the

NEW CLASSIFICATION OF BIRDS PROPOSED BY PROF. HUXLEY.

This new arrangement is based upon the characters of the palate bones—a somewhat obscure point to select as a main essential point of distinction, I must confess, it appears to me. Prof. Huxley, however, says he has no prejudice in favour of palatal characters, but that their importance had forced itself on

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his own observation, and their solution was entirely an empirical process. Guided by this character Prof. Huxley makes three orders, which he calls—

1. SAURURÆ, containing Archæopteryx (extinct).
2. RATITÆ ,, Ostriches and their allies. Apteryx (extinct).
3. CARINATÆ, divided into 4 Sub-Orders—

SUB-ORDERS	CONTAINS
1. *Dromæognathæ*	Tinamous; American bird; head like Emeu.
2. *Schizognathæ*	Cranes, plovers, pigeons, poultry, gulls, auks, penguins.
3. *Desmognathæ*	Birds of prey, ducks, geese, storks, herons, ibises, pelicans, parrots.
4. *Ægithognathæ*	Passerine birds and Swallow tribe Goatsucker, swifts, humming birds.

This arrangement separates the order CARINATÆ into sub-orders, the first of which contains only a single family allied to the ostriches, as far as its cranium is concerned, and to the Gallinaceous birds by the rest of its structure. The second sub-order (*Schizognathæ*) has a space in the roof of the mouth, between the vomer and the palate-bone, into which a knife may be passed forward. The third sub-order (*Desmognathæ*) has no open space into which a knife might be passed. The fourth sub-order (*Ægithognathæ*) has an intermediate arrangement between the second and third sub-order. It contains all the Passerine birds and Hirundines, and Humming birds. Of this classification I know but little, but I must say it seems at first sight strange to separate such birds as the Gulls, Auks and Penguins from the Duck tribe, or the Cranes from the Storks and Herons. Such a separation one would imagine could not be natural, and I confess I for one was quite content with the old arrangement consisting of the orders—

1. RAPTORES	Hawks, Eagles, Owls	Birds of prey.
2. SCANSORES....	Parrots, Woodpeckers	Climbers.
3. GALLINÆ.....	Poultry, Pheasant, Grouse.....	Poultry and Game birds.
4. PASSERES	Finches, Crows, Thrush, &c. ..	Sparrow-like birds.
5. CURSORES	Ostrich, Emew, Apteryx	Runners; some extinct birds.
6. GRALLATORES.	Stork, Woodcock, Heron, Crane, Snipe, &c.	Waders, with long tarsus.
7. NATATORES ..	Ducks, Gulls, Penguin, &c.....	Swimmers, with webbed feet.

All which orders contain natural families and are based upon the clear and obvious characters of the bill and the tarsal arrangements.

EXPERIMENTS ON SWIMMING BLADDER OF FISHES.

I pass on to notice an account of some experiments on the swimming-bladder of fishes, according to which, after the puncture of the bladder and the severing of the muscles which act upon it, and even after its complete removal, the fishes appeared to be able to rise to the surface or descend with perfect ease; so that it would seem as if the bladder was by no means an essential adjunct to swimming.

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This is, I think, only reasonable, as some very free-swimming fishes have not got a swimming bladder—for example, the common mackarel. Some naturalists regard this organ as the rudiment of a lung.

BRAIN OF DASYPUS SEXCINTES (SIX-RINGED ARMADILLO).

From an interesting paper on the brain of *Dasypus Sexcinctus*, by Professor Turner, of Edinburgh, it appears that he has found some slight indications of convolutions on the cerebral hemispheres.

This is also borne out by other observers, but still does not invalidate Owen's cerebral classification, which unites in one sub-class called *Lissencephala*, that is smooth-brained, the four orders, *Edentata*, sloths, &c.; *Cheiroptera*, bats; *Insectivora*, shrew, mole, &c.; and *Rodentia*, rabbits, &c.; for although the smoothness of the brain is the leading characteristic amongst the four orders, yet it is not unreasonable to expect to find an approach to the higher orders with gyrated or convoluted brains as we approach the higher members of the smooth-brained sub-class; for we must always remember that it is as much out of the question to attempt to draw a "hard and fast line" in natural classification as it is in a Reform Bill (applause).

This paper gave rise to a very animated discussion, in which the President, Mr. Lloyd, Mr. Cornewall, Mr. Key, Mr. Williams, and some other gentlemen took part, but as it ended with a request to Mr. Lloyd to draw up a paper on the use of the swimming bladder to fishes, and also with a request to Mr. Rankin to take up the subject of the means of flight in birds for a second paper, it is not necessary to give a minute report upon it.

The President gave the thanks of the Club to Mr. Rankin for his able paper, and then proceeded to read his own.

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ON THE BEST MEANS OF PRUNING TREES OF NEGLECTED GROWTH.

By the President, CHANDOS WREN HOSKYNS, Esq.

The recent notices in the proceedings of our Club of the trees of Herefordshire most remarkable for size and beauty, suggested to me this opportunity of saying a few words on a subject which, however important in reference to arboriculture itself as a branch of rural economy, would be less obviously appropriate were it not for the cruelty which almost every educated eye witnesses with regret in the treatment of full-grown or nearly full-grown trees whenever they are made the subject of mutilation by the ordinary modes of pruning, and this especially as seen along the sides of public roads. The fiat goes forth from the road surveyor that the trees adjoining the road should be lopped; and forthwith there commences a butchery, the results of which are the more vexatious because the ruin inflicted on the timber in point of pecuniary and pictorial value is not only incurable, but is quite unnecessary.

I need hardly describe the evil, for almost everyone is familiar with it in its two principal forms, either that of great scars left after the ruthless sawing off of large branches from the stem of the tree (commonly known to timber merchants by the jocular name of "owl's faces"), or the more elaborate mischief of what is called snag-pruning, which leaves a dead stump from one to two feet long, decaying year by year into the very heart of the timber, offending the eye far more than the honest barbarity of close-cutting. This snag-pruning is much the worse of the two; but both are most objectionable in this, that they are perfectly *unnecessary*. Any branch, the removal of which is required, can be removed from a tree not only without injury to the timber, but with comparatively small detriment even to the beauty of the tree, by the adoption of a little patience and the practical use of a little knowledge. I have practised what I recommend during 30 years—a generation—and I have never had a single instance of failure. I will try to describe it in as few words as possible.

Every branch of a tree has smaller branches of its own, and is, in fact, to them a *tree*. Every naturalist knows that the trunk of a tree is fed by its branches, just as a river is by its tributaries. If this one simple fact, viz., that the growth of a tree is *from its foliage*, were known or even believed, by woodmen (or whoever they may be who venture to practise amputation without understanding the physiology of the plant), no such thing could ever occur as a tree injured by pruning, either for value or for appearance. When any offending branch is condemned, instead of proceeding by capital punishment, (which admits of no repentance, *except to the inflictor*), the humane process is this. I said that every branch has its own branchlets. Select one of these latter, which happens to grow in the most favourable direction, and at the point where it springs take off the main branch with an oblique cut in the direction of the

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growing branchlet, under-cutting it first to prevent spaltering, and pare the wound as much as possible into symmetry with the direction of the new leader. In another year or two, serve this new leader exactly in the same way, taking it off with a similar oblique cut, but on the side opposite to the last, so as to leave the new leader (No. 2) growing as nearly as possible in the direction of the parent branch that was first amputated. Year after year, or with an interval of two or three years, as the case may require, let this process be repeated. The result is this. The growth of the original condemned branch is entirely stopped without its being itself *killed*. Meantime, the stem (of a growing tree) will have been increasing in girth; and the condemned branch which formerly looked so large becomes so small, and apparently (but not really) shrunk, in proportionate size, that it generally may, after a few years, be removed entirely, without injury or eyesore, close to the stem: for this, I need hardly say, may be always done when the proportionate size of the cicatrix to the stem is such as to heal perfectly in two or three summers.

I am sorry to appear as an advocate of deception, but I can hardly exaggerate the success of it in this case, if the amputation is performed at the proper time of the year, which is in the early summer, immediately after the leaf is expanded. Every week that is allowed to elapse after this time, the operation is less effective, and the worst time of all is the late autumn, the time commonly adopted by woodmen. The reason of this is simple. The new branch leader has time to establish itself as a life retainer to the stump, and if healthy, does a good deal towards healing the wound, especially if cut very obliquely. The alburnum is protected before its enemy the frost comes; and when the foliage falls away (the trying moment for appearance) the summer growth will have given to the new leader something of the character of a real continuation of the branch that has been thus foreshortened.

Of course all pruning of a neglected tree presents some degree of mutilation to the eye for a longer or a shorter period. Foreshortening a branch—that is dealing with it as I recommend—can never be in itself desirable. It claims only to be the best form of secondary treatment of that which was not dealt with at the proper time. The great advantage of the system is that it is based upon the physiological principles of growth, instead of acting against them; that it takes Time into partnership, and produces the result desired with the least ultimate deterioration of the appearance, and none whatever of the timber, of the tree. It is difficult, without the aid of a diagram, to convey by description the mode and the progress of the treatment; but this aid I will give it, should these hints hereafter appear in our transactions.

The Rev. R. H. WILLIAMS said that he could endorse every word of the excellent practical statement the President had put so clearly before them, not only with regard to deciduous trees but in respect of evergreens also, and particularly of the conifers. Shy as the fir tribe were of side pruning, by proceeding on the President's plan of a sloping cut near a twig, he had made them throw out new branches and feather to the ground. Where there was more than one

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leader he had also succeeded, by the same method, in recovering the tapering form of the tree. He could mention several instances. From a fine *Abies Morinda*, or Himalaya spruce fir at Bredwardine vicarage of some 30 or more years growth, he cut two out of three leaders of rather large size some few years back, and it is now a most beautiful tree. Several Corsican or Laricio pines, near Llandudno, of about the same age, had also turned out equally well under the same treatment. In common spruce firs and in many other coniferæ—so sparing in leaders as they always were—he had been very successful in restoring a leader, or in procuring side shoots where they were required. He mentioned those trees particularly because they were of all trees the shyest of the pruner's knife. The only point in which he differed from the President was as to the best time for pruning. When done so late in spring as he had named, the branches were full of sap, and sometimes bled so freely as to weaken the tree.

The PRESIDENT did not believe in bleeding—(a laugh)—that is to say, the sap drawn up by the roots from the soil was not true blood until it had been acted upon in the leaves of the tree. It was simply a loss to the sap from the soil, which contained an abundant supply to replace it. It was the descending sap which gave nourishment to the tree, and there was no loss of this. (A voice: "What of the vine?") The vine was a *fruit* tree, and was grown under exceptional circumstances, with a forced circulation, and usually a circumscribed root supply. This did not apply to our forest trees.

A general conversation now ensued, in which the opinion seemed to prevail that bleeding was a term not properly applicable to the escape of the *rising* fluid from which the sap is made, and that the effusion of the ground sap which occurs to the *Birch*, the *Sycamore*, and some fruit trees when lopped, is less important than is commonly supposed.

JOHN LLOYD, Esq., of Huntington Court, remarked that of the three modes of pruning oak trees of which the President had given an account, that of shortening the branch was, wherever practicable, the most advantageous. The first method—that of cutting off the limbs close to the tree—was objectionable, because, although the wound usually healed closely over, yet the core of the branch remained in the tree unaltered, and would form a bad knot in the timber when felled. Hence timber merchants looked very suspiciously on hedgerow timber, which were usually lopped in this manner. Of course, if the trees were young saplin oak, it is far better to take off the young branch close to the stem. The second plan—that of cutting off the branches a foot or so from the tree—is to be studiously avoided. In all cases, such a mode of pruning is very unsightly, and sooner or later the stump decays, and the wet finds admission into the trunk of the tree. The third method, and that recommended by the president, is the best to be adapted in all full-grown trees. In removing the large branches they should be taken off at some distance from the stem, and immediately above a twig or branch of sufficient size and strong enough to draw

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the sap up from the parent tree and keep the stump alive. We all saw the principle of this annually carried out by our gardeners. When the branches of a pear tree reached the garden door, or any other point where they could not be trained further, the gardener shortened the branches, allowing a side shoot to take the place of the original leader. The great difficulty with large oak trees was to find leaders on the side of the branches that were required to be cut off; in many instances he knew branches stretched out for 20 feet without a single side branch, and it would be very provoking to know what to do in such instances. The subject treated of by the president was one of great importance, and in days long gone by, when the forests for the supply of oak for the navy were very carefully treated, the subject then received more attention than it did at present, and, if he remembered right, one gentleman, a Mr. Forsyth, had received large sums of money from the Government for making known his discoveries on this subject, and of a prepared mixture to be applied to the *cicatrices* of the pruned branches, and which was alleged to make the bark heal quickly over. Mr. Lloyd concluded by thanking the President for his able and interesting paper.

A general conversation again ensued on several points relating to the subject, in which many gentlemen took part, when

Dr. BULL said, the real difficulty with neglected forest trees was the practical one of getting at the branches to prune them rightly. They would most of them remember that when Fortune returned from China, amongst the marvels he brought with him, none, perhaps created greater surprise and attention than some dwarf forest trees growing in small China vases—forest trees in miniature. There were some such perfect specimens of the elm tree, about 15 inches high, growing in pots about a foot long, eight inches wide, and five deep, and bearing such apparent marks of great age and full growth that it was at once considered by botanists as a peculiar variety, and received the name of *Ulmus parvifolia Sinensis*. It turned out, however, to be nothing more than a variety of the common *Ulmus campestris*, for when taken out of the vases and planted in good soil in the Horticultural Society's garden, in a year or two they began to make shoots five or six feet long. In short it was nothing more than a dwarfed tree produced by constant and careful manipulation. The way in which the Chinese produce these miniature trees so fully bears out the President's paper in its physiology and practice, that he would give it, as described by Loudon. They first select a small piece at the end of the branch of an old tree, and put a tight ring on it. A callosity quickly forms above the ring, which they surround with a ball of loam kept moist by wet moss. Roots are soon thrown out, and then the branch is cut off and planted in a porcelain pot of the size named. In it they also place pieces of stone to represent rock, amongst which, moss and lichens are introduced. They then give it only just enough water to keep it alive, and as the pot soon acts as a prison, its growth is necessarily impeded. Its further growth is also still more checked by constantly

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and carefully cutting off the point of every shoot, and the half of every new leaf. Then the stem and branches are bound and fantastically distorted by means of wire; the bark is lacerated to produce protuberances, asperities, and cracks. One branch perhaps is partly broken through and allowed to hang down, as if by accident; another is mutilated to represent a dead stump; in short every natural effort of the plant is checked by some studied violence or other. Thus in course of time a forest tree in miniature is produced bearing all the marks of a venerable antiquity (a laugh). With constant attention to branch pruning you may make trees grow as you please, and if you take the roots too into charge and regulate the supply of moisture, you can control their size.

He had brought with him some sections of young larch fir trees for their inspection, which showed very clearly the effect of a varying amount of rainfall in the variations of thickness in their annular circles of growth. They had often heard of the general effect of an abundance of forest trees in producing an increased rainfall, but he had now to show them the effect of an increased rainfall, in producing greater growth in the trees. These sections of trees had been kindly sent to him by Mr. Wells of Holm Lacy, and he thought he could not do better than read to them Mr. Wells's own account of them.

"Passing through a plantation of young larch the other day, which I knew to be twenty years old, I was examining some which had just been felled, and counting the annual rings to see if they corresponded with their age, when I was very much struck with the close resemblance which all I took notice of had to each other. At the twelfth year, counting the annual rings from the outside, something had checked the growth of the tree. When I referred to a memorandum of the rainfall I found that that very year was the driest season in the age of the trees (1854). It that year there was only 14 inches of rainfall, and in the following year (1855) though we had 20 inches of rain, which is still below the average, yet the influence of the twelfth is seen in the eleventh year. Then if you go on to the fourteenth year (1852) you find a great increase in the thickness of the annular ring, and in that year we had the very large rainfall of 40 inches, but since 22 inches fell after July its influence would be expected to show itself in the next year, the thirteenth, and this you see is large also though the rainfall for that year was only 23 inches. The three other rings you will also observe are very narrow, and you will remember the last three years have been dry—for though last summer was wet, it was made so by the autumn rain which fell too late to take effect on the larch." Mr. Wells also refers to a decayed portion in the centre of one of the sections, which he believes to have resulted, "from injury received probably the year after planting from the teeth of a rabbit."

The sections of the trees were examined with very great interest, and the twenty rings of their annual growth were very distinct, and corresponded closely in their variations of thickness in the sections of the different trees.

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Dr. Bull said he had hoped to have been able to carry the examination of the several rings much more closely in comparison with the meteorological peculiarities of the corresponding years of their growth, but he had been unable to obtain sufficiently accurate observations on the weather for so long a period.

A general conversation about them then took place between several of the members, but it was brought to an abrupt conclusion by the announcement that the time had expired, and the rush to the railway station quickly emptied the room.

In the true spirit of the motto of the Stoke Edith sun-dial, this meeting must be recorded in the annals of the Woolhope club, as a bright and pleasant day most enjoyably spent.

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The Woolhope Naturalists' Field Club.

THE ANNUAL MEETING,

THURSDAY, MARCH 26TH, 1868.

This useful and flourishing society held its annual meeting at the Green Dragon Hotel, on Thursday last; Chandos Wren Hoskyns, Esq., in the chair. There was a good attendance of members, consisting of the Vice-Presidents, the Rev. S. Clark, of Bredwardine, Humphrey Salwey, Esq., of Ludlow, and T. Curley, Esq., F.G.S., of Hereford; the Honorary Secretary, the Rev. Geo. H. Cornewall, of Moccas; Edwin Lees, Esq., F.L.S., Vice-President of the Worcestershire Naturalists' Field Club; the Rev. Wm. Houghton, of the Severn Valley Field Club; the Rev. J. D. La Touche, of the Caradoc Club; Dr. Bull; the Rev. H. Cooper Key, M.A.; Dr. M'Cullough, Abergavenny; the Rev. H. T. Hill, M.A., Felton Rectory; James Rankin, Esq., Bryngwyn; the Rev. Robert Dixon, Hereford; R. Lightbody, Esq., Ludlow; John Lloyd, Esq., Huntington Court; Arthur Armitage, Esq., Dadnor; the Rev. J. F. Crouch, Pembridge; Captain Pateshall; the Rev. Wm. Jones Thomas, Llan Thomas; the Rev. J. Woollam, M.A., Hereford; Marcellus Newton, Esq., Sugwas; the Rev. Thomas Phillipps, Dewsall; J. Griffith Morris, Esq., Hereford; Thomas Blashill, Esq., London; the Rev. F. T. Havergal, Hereford; Flavell Edmunds, Esq., Hereford; the Rev. T. West, Fownhope; Wm. Miller, Esq., Hereford; the Rev. R. H. Williams, Byford; the Rev. E. Du Buisson, Breinton; J. F. Symonds, Esq., Hereford; C. G. Martin, Esq., Hereford; James Davies, Esq., Hereford; Henry J. Jenkins, Esq., Holmer; the Rev. C. J. Westropp, Wormbridge; the Rev. E. Cuningham, Hereford; the Rev. Thos. Bird and Mr. Wm. Bird, Yarkhill; T. J. Salwey, Esq., Ludlow; R. H. P. Styles, Esq., Hereford; O. Shellard, Esq., Hereford; H. C. Hurry, Esq., Hereford; Mr. Henry Southall, Ross; Mr. With, Hereford; Mr. Henry Blashill, Hereford; Mr. Watkins, Ross; and the Assistant Secretary, Mr. Arthur Thompson, Hereford.

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The general business, which it is always necessary to transact at this meeting, was at once proceeded with. William Henry Cooke, Esq., Q.C., was unanimously elected a member, and no less than eleven other gentlemen were proposed for election at the next meeting.

The Rules as revised by the Central Committee for the purpose of adapting them to present circumstances were then presented, and after due explanation adopted.

The financial statement was then read and passed. It need only be said with reference to this, that notwithstanding the very handsome volume brought out last year by the Club, and the preparations for the present one, a very satisfactory balance still remained in hand.

Several other matters were then brought forward by the Central Committee with reference to the future management of the Club, and the following officers for the ensuing year were unanimously elected: President, Dr. M'Cullough, Abergavenny; Vice-Presidents, Chandos Wren Hoskyns, Esq., the Rev. H. Cooper Key, M.A., James Rankin, Esq., and Thomas Blashill, Esq.; Central Committee, Dr. Bull, T. Curley, Esq., and John Lloyd, Esq.; Honorary Secretary, the Rev. George H. Cornewall; Treasurer and Assistant Secretary, Mr. Arthur Thompson.

The President elect duly expressed his acknowledgments for the honour done him, and a vote of thanks was then proposed to the retiring President for his services during the past year, and was carried with great cordiality. Hard indeed, was it said, would that rule of the Club be, which restricts the tenure of office to a single year, were it not that it permits of after re-election. The past year had been so successful under Mr. Hoskyns' presidency, that the wish that he might often again fill the office was received with great applause.

The places of meeting for the next year were then fixed upon as follows:—Friday, May 22nd, Hereford, for the Hampton Court Estate; Thursday, June 18th, Crumlin Viaduct and Pontypool; Tuesday, July 14th, Penwyllt Station; Tuesday, July 28th, Ludlow, to meet the Caradoc Club; and Tuesday, August 25th, Hereford, for some portion of the surrounding district.

The following Report was then presented.

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METEOROLOGICAL OBSERVATIONS FOR 1867.

By E. J. ISBELL, Esq., Hereford.

Our meteorological observations have been carried on through another year, and duly recorded, without any interruption of importance or any serious accident to instruments, and the results are now presented to the Club in the form of tables drawn up with great care.

It was found impossible to condense our matter this year into the limits of one table, or indeed into two, we have, therefore, made out three, arranging our work as follows :—

Table 1. Barometer, rainfall, wind.

Table 2. Thermometers.

Table 3. Ozone.

It will be seen by a glance at the table (1) that the range of the barometer has been great during the past year, the highest reading at 9 a.m.—the regular hour of observation—being 30·586, and the lowest 28·532. The former of these readings was recorded on the 2nd of March, and the latter on the 8th of January. With respect to the last-named reading, it should be noted that at 9 a.m. the barometer was rising, and that at 3 a.m. the mercury stood at 28·410, which I believe to have been the greatest depression during the year.

The barometer was remarkably high and steady during the whole of November, or nearly the whole ; the 9 a.m. readings having been above 30 inches on 22 days, and the mean of the readings for the whole month being 30·093 inches.

I mentioned in the notes of last year that we do not reduce our barometer readings to sea-level, but correct for temperature and error of instrument only, so that the figures given weekly in the *Hereford Times* may enable those who wish to do so to ascertain whether their barometers are correct or the contrary, and give observers who possess standards an opportunity of comparing their observations with those taken daily at Hereford.

The highest and lowest barometer readings in each month, together with the monthly means, will be found in the table (1). I would have added the date in each case, but found the space insufficient.

The mean reading for the year was 29·768, the average in England at sea-level being 29·95. Hereford is, I believe, about 200 feet above sea-level, so that the Hereford mean reduced to sea-level would agree almost exactly with the given average of the barometer at sea-level in England,

Early in the year a proposal was made by Mr. G. J. Symons that all observers who had good barometers should undertake a series of observations simultaneously, beginning on May 24th and ending on June 2nd ; the barometers to be read off and recorded each day at 9 a.m. and 3 and 9 p.m. if possible ; but

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at all events at 9 a.m. The object of Mr. Symons in proposing these observations was, that by a careful comparison of the returns, approximate determinations might be arrived at respecting the heights of rain-gauges above sea-level in those numerous places where observers have been hitherto in doubt on this point.

By my daughter's assistance, who from long practice has become a skilful observer, I was enabled to record three readings daily; and the blank form furnished by Mr. Symons was filled up at an early period and forwarded to his address.

Whilst waiting for a reply, I determined to make a careful measurement, by barometer, of Garway Hill; a station of the engineers during the Ordnance Survey of this county, and the nearest point to Hereford having its height above sea-level given in the Ordnance map. Garway Hill is, according to this authority, 1,197 feet above sea-level at half tide, and ten miles in a straight line from Hereford bridge.

On the 19th of September, in company with Mr. Cooke, I visited this hill, carrying with me the Woolhope standard. From observations made simultaneously on the summit of Garway and at my house, it appeared that the difference of atmospheric pressure between the two places amounted to 1·067 inch, and this difference, with a mean temperature of 57·1 (lat. 52 nearly) shows a height of 997·627 feet, or, in round numbers, 997 feet 6 inches nearly. But the cistern of my barometer stands 4 feet 10 inches above the ground, and the cistern of the barometer on Garway was about 17 inches above the top of the hill when the instrument was suspended for observation; if, therefore, we add the 4 feet 10 inches to the height given above and subtract the 17 inches, we shall find the summit of Garway to be 1,000 feet 11 inches above Hereford. Deduct 1,000 feet 11 inches from 1,197 feet, and we find Hereford to be 196 feet 1 inch above sea-level.

Early in the present year I received a notice from Mr. Symons to the effect that, from the barometer readings I had sent in, the height of Hereford above sea-level had been ascertained to be 200 feet.

I shall be glad to make another measurement of Garway, but feel pretty certain that the height of this city above sea-level is not more than 200 feet or less than 195 feet. And I am strengthened in my belief on this point by the fact that the length of the Wye from Hereford Bridge to the mouth of the river at Chepstow is a little over sixty miles, with a fall so rapid in many places that it is difficult to imagine it to have an average fall of less than three feet to the mile. Hereford, at the High Town, is probably about fifteen feet above the surface of the river at moderately low water.

During the past year we have also by means of the two standards measured the heights of the following hills:—Acornbury, 719 feet; Credenhill, 530 feet; Backbury, at the fir trees, 505 feet; Hough Wood, 416 feet; Dinedor, 409 feet.

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These heights are calculated from the levels of Richmond-place, and 196 feet 1 inch must be added to give the height of either of these hills above the level of the sea. With respect to Backbury, I wish to mention that the fir trees do not stand upon the highest point of the hill. I hope to measure this hill again, and to obtain permission to place the barometer on the most elevated part of the camp.

The altitudes given above are, I am satisfied, very close approximations to absolute truth; for the measurements were made with care for all the hills, and repeated with satisfactory results for Acornbury, Credenhill, Hough Wood, and Dinedor. Garway and Backbury have each been measured once only; but on Garway several observations were made at short intervals, answering to a corresponding number made at Hereford, and the calculations were worked out separately by the Rev. R. Dixon, Mr. Easton, and Mr. Cooke.

Measurement of altitude by standard barometers is wonderfully accurate provided certain conditions are observed. In the first place, of course, it is necessary that the barometers should be of the best description. Their errors must be known. They must read to the 500th of an inch. In the second place, it is important to possess *two* instruments, so that the pressure of the atmosphere at the upper and lower stations may be determined at the same moment. In the third place, it is important to determine the air temperature by means of good thermometers so placed at both stations as to furnish correct information on this point. In the fourth place, it is desirable to reduce the horizontal distance between the upper and lower stations as much as possible.

Mr. Drew, in his "Practical Meteorology," informs us that on one occasion the following experiment was made at Greenwich:—Observations were first made in the transit-room of the Royal Observatory, and at the base of the statue of George II., in Greenwich Hospital, to determine the difference of altitude, and then the barometer work was tested by means of the spirit-level. The results were as follows:—By barometer 135·4 feet; by levelling, 135·57 feet.

The measurement of Etna affords a striking proof of the value of the barometer as an instrument for ascertaining the heights of mountains. This volcano was measured by Captain Smyth, in 1815, by trigonometrical survey, and found to be 10,874 feet high. In 1824, Sir John Herschel, ignorant of the height assigned to the mountain by Captain Smyth, measured its altitude by barometer, and found it to be 10,872 feet 6 inches!

I must, however, allude to one source of error which may in some small degree vitiate our measurements, and it is this: At the time the measurements were made the Woolhope barometer had not been tested, and in correcting for error of instrument we depended partially on the correction given by the maker and partially on a correction derived from a comparison of this barometer with my own: but any error arising from this source must be very small indeed.

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The Woolhope standard is now at Kew, and we can do nothing until it has been returned to us with a character; but it will be well to continue these observations as occasion may offer, both because we shall thus obtain a very close approximation to the exact heights of all the hills in the neighbourhood of Hereford, and also because the proving of our work by levelling, which sooner or later will doubtless be done, will enable all who are interested in the question to form a judgment respecting the value of the barometer as an instrument for measuring altitudes.

The aneroid has been used by us in conjunction with the mercurial barometer whenever Mr. Cooke has taken part in our proceedings, and we are well convinced that its value as a substitute for the latter is very great. In our work we have used an aneroid by Negretti and Zambra; it belongs to Mr. Cooke, and its performance is excellent. Dr. Balfour Stewart, Superintendent of Kew Observatory, and, of course, a very high authority on all such points, speaks highly of the accuracy of the aneroid when applied to the measurements of heights. He has, I believe, suggested a method for the correction of a certain amount of error which the instrument is liable to when taken up very high mountains. Correction for temperature (for the aneroid) is still a question.

Further trials of this kind are very desirable; the portability of the aneroid making it a most valuable instrument even *now;* but an instrument absolutely perfect, if a table of corrections could be made out rendering it possible to compare its readings accurately with those of a standard barometer.

The mean temperature for 1867 was 48·33, as shown by the thermometers placed in my garden. According to the Blue School thermometers it was 48·45.

Mr. Glaisher has determined the average yearly temperature at Greenwich to be 49 and a very small fraction. We were therefore a little below the average in 1867, but the temperature was occasionally very high. The table (2) shows high thermometer readings in May, June, July, and August. In the last named month the thermometer in shade rose on one occasion to 89·6.

The lowest temperature occurred on the 5th of January, when the thermometer went down to 8·5.

The monthly means, as shown by the thermometer at the Blue School, came very near those calculated from the day and night readings of the instrument in my garden. The latter will be found in the table (2), the former are as follows:—January, 34·2; February, 45·19; March, 36·67; April, 49·34; May, 52·82; June, 57·91; July, 59·44; August, 61·18; September, 56·37; October, 49·64; November, 39·59; December 39·12.

The thermometer-stand at the Blue-school is attached to the wall of the school (a wall without door or window), and the instruments are in some measure affected by the temperature of the building. They appear to be cooled during the day, at least in warm weather, and warmed at night during cold seasons; but

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the *means* for each month are certainly very near the truth, the artificial cooling and heating just mentioned appearing to balance each other very perfectly.

On the 27th of June, at 2 p.m., a very extraordinary difference between the dry and wet bulbs was recorded, viz., 17 degrees. The degree of humidity on this day amounted to 42·8 only, the air being drier then than at any other period during the whole year.

Whilst upon the subject of thermometers I may do well by giving a hint to those who are about to commence observations with these instruments, respecting the great importance of placing them properly. In no case should thermometers be attached to the walls of buildings. Properly constructed stands should be used; that contrived by Mr. Glaisher being, I believe, the best. The thermometers should be protected from rain, but exposed freely to the action of the air; the open side of the stand should face north, and there should be, at least, a clear space of 50 feet in length in front, precautions being taken to protect the instruments from the rays of the morning and evening sun during the summer. The thermometers should be suspended four feet from the ground.

The rainfall at Hereford during 1867 was about 1 inch over the average, or that which we regard as the average, viz., 27·145 inches. (See Table I.)

With respect to the eight-inch raingauge belonging to the Club, I am now, quite satisfied that the instrument is perfectly correct in itself, and that the error alluded to in our report for 1866 is due to situation alone. This raingauge has been removed from the Blue School play-ground and is placed in Mr. Davison's garden near the White Cross; it is examined daily at 9 a.m. and the quantities are carefully recorded.

I have recently placed a five-inch gauge in the stand at the Blue School, but the amount of rainfall collected is always a little less than that caught by the other Hereford gauges. The wind appears in some way to affect raingauges more at this point than at any other which I have tried in the neighbourhood of Hereford.

The Ozone observations (Table 3) have been carried on by Rev. H. C. Key, and duly recorded, since May 2nd, 1867. The results will be found in the table (3). We have found *home made* test papers far better than those purchased in London; and of all formulæ given for the preparation of ozone paper, I find that furnished by Dr. Kemp to be by far the best. Dr. Kemp's formula is as follows:—Bibulous paper, white, tested for chlorine and hyposulphite of soda: these to be removed by washing if present. Then make the following mixture, pure starch 8 grains, iodide of potassium 10 grains, boiling water 1 ounce. Mix and boil together. Saturate the paper and dry rapidly before a good fire but without scorching.

To this I would add that I have found the white blotting paper sold by Mr. Head, of this city, perfectly free from impurities. I choose a strong sort because it is less liable to tear when wet, and heavy with the starch. It is

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important to use *pure* starch, because common starch contains impurities which will vitiate the test and lead to wrong conclusions. The starch should be mixed in the usual manner; then the iodide of potassium must be dissolved in a small quantity of water and mixed thoroughly with the starch; then the two must be boiled together for a minute, an operation which requires some care; then the paper is to be immersed in the mixture for at least five minutes, taken out, dried, and bottled. Scorched paper must be rejected.

Whatever ozone may turn out to be, it is certain that it is difficult to discover its presence in the neighbourhoods of dunghills, foul drains, or cesspools. In the streets of large cities it is, I believe, never detected. We may therefore in a measure regard the ozone's test as a test of the purity of the air we are breathing, and with this view I had, during the past year, four small boxes made, something like dark lanterns, and set up in different parts of the city of Hereford in order to test the comparative condition of the atmosphere of the place in four situations tolerably distant from each other.

These four situations were as follows:—Richmond-place, the Blue School play-ground, High-town, and St. Peter's School play-ground.

Of the stations named above, Richmond-place stood first in capability of manifesting the presence of ozone, Blue School play-ground took the second place, High-town the third, St. Peter's play-ground the fourth. But Richmond-place and the Blue School would at no time bear comparison with the open country. I have an ozonometer in Mr. Davison's nursery garden, near the White Cross, and there the papers will occasionally indicate an amount of ozone far beyond the maximum of the standard scale. I cannot, however, attend to these observations myself, and as my friends who *do* attend to them are sometimes absent from home, I am unable to present the Club with any satisfactory records of work done at this station.

The only remarkable storms I find recorded during 1867 occurred as follows:—January 7th, 8th, 9th, heavy rain, with a strong gale on the night of 7th-8th. The great depression of the barometer on the morning of the 8th has been already noticed.

February 5th-6th, a strong gale during the night.

March 12th, 13th, 14th, much snow; also on the 18th, 19th, 22nd; then a thaw on the 23rd, and heavy rain followed by a great rise of the river and floods on the White Cross Road, at the Barton Station, and at Widemarsh. From the 25th to the 31st the road at Widemarsh was impassable for foot passengers.

April 14th, 15th, 16th, weather very stormy; squalls rising at times to strong gales.

May 13th, 21st, 26th, large amount of rainfall measured on the mornings of each of these days, especially on the 21st.

July 13th to 18th, hard squalls with much rain. The latter sufficient to raise the amount for the month very much above the average.

August 20th, a thunder-storm, with heavy rain.

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September 3rd, three thunder-storms, recorded in my notes as follows:—"Thunder-storm, with heavy rain for a short period, began about 5.30 a.m.; it did not last long, but a second storm commenced early in the afternoon and was much longer in its duration; a third took place in the evening. All heavy storms with forked as well as sheet lightning. Rainfall during the storms 0·962 inch.

October, large amount of rainfall, measured on the mornings of the 10th and 16th.

December 1st-2nd. A great gale at night. The barometer went down to 28·8, but began to rise at 6 p.m., at which time it began to blow. A strong gale on the night of 14th-15th; high winds on the 16th; frosts with thick fog on the 26th and 27th.

In conclusion, I may as well record that the November meteors were invisible here. They were seen in America, but the spectacle there was not, I imagine, so grand as that with which we were favoured last year. The following figures will show correctly, I believe, the number counted at the Magnetic Observatory, Toronto, Canada, on the night of November 13th-14th: Midnight to 1 a.m., 20; 1 to 2, 44; 2 to 3, 123; 3 to 4, 560; 4 to 5, 1345; 5 to 6, 195. Total, 2,287.

On account of some who may not have an opportunity of perusing the tables, I subjoin the following statistics:—

Highest reading of bar., March 2nd	30·586
Lowest reading of bar., January 8th	28·410
Mean for the year	29·768
Highest reading of therm., August 13th	89·6
Lowest reading of therm., January 5th	8·5
Mean temp. of year	48·33

RAINFALL.

January ...	3·767 inches.	July ...	3·309 inches.
February ...	1·840 ,,	August	1·419 ,,
March ...	3·999 ,,	September	2·229 ,,
April... ...	2·584 ,,	October	3·299 ,,
May	2·682 ,,	November	1·059 ,,
June	0·892 ,,	December	1·092 ,,

Total ... ... 28·171

Mean degree of humidity ... ... 74·9

WIND.

N on 29 days; NE 40 days; E 18 days; SE 31 days; S 31 days; SW 100 days; W 36 days; NW 55 days; calm or uncertain 25 days.

A series of observations on the rainfall at Pool Cottage, Dewchurch, by the late Capt. Pendergrass; at Titley, by the late R. B. Boddington, Esq.; at Hereford, by the late Henry Lawson, Esq.; and at Rocklands, by J. M. Herbert, Esq., were also ordered to be printed.

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TABLE I.

1867.	BAROMETER.			RAINFALL.			WIND.							
	Highest Reading at 9 a.m.	Lowest Reading at 9 a.m.	Monthly Mean.	Stretton. Rev. H. C. Key.	Hereford. Mr. Isbell.	Tupsley. Mr. Ballard.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
							Days	Days	Days	Days	Days	Days	Days	Days
January	29·927	28·532	29·480	4·22	3·767	4·27	2	1	2	3	3	7	5	8
February	30·331	28·655	29·857	2·19	1·840	1·68	0	1	3	4	4	15	1	0
March	30·586	29·045	29·623	3·89	3·999	3·89	3	12	6	5	0	3	2	0
April	30·231	29·030	29·602	2·52	2·584	2·55	0	1	0	1	0	16	8	3
May	30·000	29·276	29·704	2·90	2·682	2·97	3	7	1	5	4	5	0	1
June	30·426	29·485	29·930	0·94	0·892	0·76	6	4	0	1	2	4	4	7
July	30·128	29·272	29·693	3·25	3·309	3·51	3	3	1	3	2	7	1	6
August	29·976	29·486	29·786	1·44	1·419	1·15	0	2	1	3	3	14	4	2
September	30·320	29·520	29·883	1·90	2·229	2·13	4	1	1	2	3	7	3	3
October	30·268	29·199	29·719	2·98	3·299	3·22	3	1	0	2	7	11	3	3
November	30·464	29·231	30·093	0·93	1·059	0·85	4	3	2	2	0	4	2	12
December	30·187	28·991	29·854	1·01	1·092	1·22	1	4	1	0	3	7	3	10
Yearly Mean			29·768	28·17	28·171	28·20	29	40	18	31	31	100	36	55

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TABLE II.

1867.	THERMOMETERS.											
	Highest Reading in shade; and day of month.		Lowest Reading during the night previous to the date given.		Highest Reading of Black Bulb Therm. in sun; and day of month.		Lowest Reading on the grass; and day of month.		Mean of day Readings in shade.	Mean of Night Readings	Monthly Means	Degree of Humidity
January	55·9	7th	8·5	5th	65·8	7th	10	15th	40·73	28·97	34·65	83·8
February	56·9	20th	32·7	3rd, 15th, 27th	79·1	20th	25	3rd	51·11	39·64	44·97	81·1
March	55·6	25th	21	21st	75·7	15th	19	3rd	43·67	31·03	36·35	71·6
April	64·6	29th	31	12th	80·1	29th	26·5	12th	58·27	42·78	49·02	72·21
May	82·9	8th	32	23rd	100·8	8th	29·6	23rd	64·52	44·09	52·60	64·84
June	84·2	11th	39·7	8th	125	27th	36·9	8th	71·16	48·88	58·22	63·5
July	83·1	11th	40·7	28th	116·5	8th	35·9	28th	72·34	50·01	59·32	63·7
August	89·6	13th	40·2	28th	126·9	13th	37·5	7th, 8th	73·37	52·61	61·29	68·39
September	78·1	1st	35·7	26th	123	2nd	34·2	25th	67·09	46·89	55·69	74·23
October	66·5	22nd	31	4th	108·6	1st	25·6	4th	57·42	41·89	48·65	79·1
November	58·1	1st	21·3	29th	93·9	2nd	20·7	29th	46·99	33·16	39·67	84·0
December	56·3	15th	21	4th	79·2	16th	20·2	4th	44·60	34·69	39·64	86·0

Yearly Mean Temperature, 48·33.

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TABLE III.

OZONE RECORD, 1867.—By Rev. HENRY COOPER KEY, Stretton.

MAY.			JUNE.			JULY.			AUGUST.			SEPTEMBER.			OCTOBER.			NOVEMBER.			DECEMBER.		
Day	Ozone	Wind	Day	Ozone	Wind	Day	Ozone	Wind	Day	Ozone	Wind	Day	Ozone	Wind	Day	Ozone	Wind	Day	Ozone	Wind	Day	Ozone	Wind
1	—	—	1	4	SW.	1	4	W.	1	4	E,NE.	1	2	SW.	1	4	NW.	1	7	NW.	1	7	SE,NW.
2	4	NW.	2	3	SW.	2	1	S.	2	2	NE.	2	5	E,SW.	2	5	W.	2	3	N.	2	7	N.
3	3	SE,SW.	3	3	NW.	3	7	SW.	3	5	NW.	3	3	S.	3	4	W.	3	5	NW.	3	5	NW.
4	5	SW.	4	6	W.	4	4	W.	4	4	W.	4	6	SW.	4	4	N.	4	4	W.	4	3	NW.
5	5	S.	5	6	SW.	5	4	E.	5	3	W,SW	5	6	SW.	5	3	N.	5	2	NW.	5	7	NW.
6	4	SE.	6	6	S.W	6	3	E.	6	6	W.	6	6	SW.	6	4	SE,W.	6	2	N,NE.	6	7	NE.
7	4	SE.	7	6	NW.	7	3	NE.	7	4	SW.	7	4	SW.	7	4	W.	7	2	N.	7	6	NE.
8	3	SW.	8	6	W.	8	3	NE.	8	6	W.	8	4	SW.	8	3	W,NW.	8	2	—	8	7	N.
9	5	SE,SW.	9	6	W.	9	4	W.	9	4	SW.	9	4	SW.	9	1	SE,S.	9	1	N.	9	3	NE.
10	4	SW,S.	10	6	W.	10	3	NE.	10	3	SW.	10	3	SW.	10	1	N.	10	2	NE.	10	6	NW,W.
11	3	SW,SE.	11	5	S.	11	4	E.	11	3	SE,S.	11	5	SE,SW.	11	0	SW,SE.	11	1	NE.	11	6	NW.
12	4	SW.	12	5	W.	12	4	W.	12	3	E,S.	12	3	SW.	12	1	NE,E.	12	0	NE.	12	7	W.
13	5	NE.	13	4	W.	13	6	W.	13	4	SE.	13	3	S.	13	2	SW.	13	0	NE.	13	6	W.
14	5	NE.	14	5	NW.	14	4	SW.	14	3	SW.	14	6	SW,W.	14	2	SW.	14	0	S.	14	7	W.
15	6	E.	15	5	W,N.	15	7	SE,S,W.	15	3	NE,NW.	15	3	NW.	15	1	SW.	15	3	SW.	15	6	W.
16	6	E.	16	5	W.	16	5	W.	16	4	W.	16	4	NW.	16	7	S,SW.	16	6	NE.	16	7	W.
17	5	E.	17	5	NW.	17	6	W.	17	5	SW.	17	4	N.	17	6	SW.	17	5	NE.	17	4	W.
18	4	SW.	18	4	NW.	18	5	W.	18	3	SW.	18	3	NE.	18	2	SW.	18	3	NE.	18	5	W.
19	4	E.	19	3	NW.	19	6	W.	19	4	SW.	19	4	N.	19	1	SW.	19	3	N.	19	3	W.
20	5	SE.	20	3	NE.	20	5	SW,S.	20	4	W.	20	1	NE.	20	4	W.	20	3	NE.	20	1	E.
21	6	E.	21	4	E.	21	4	SW,	21	1	W.	21	3	SW.	21	0	S,SW.	21	3	N.	21	5	W.
22	5	NE.	22	5	W.	22	6	SW.	22	2	SW.	22	3	SW.	22	1	SW.	22	2	N.	22	3	NW.
23	7	NE,N.	23	3	NW.	23	4	SW.	23	3	SW.	23	3	SW.	23	2	S,SW,SE.	23	3	N.	23	4	SE,SW.
24	4	N.	24	3	NW,NE.	24	4	SW.	24	3	SW.	24	3	SW.	24	0	NE,E.	24	0	W.	24	6	SW.
25	6	NE,E.	25	4	N.	25	4	SW,E.	25	3	SW.	25	4	SW.	25	2	NE.	25	1	NW.	25	1	W.
26	6	E,SE.	26	4	N.	26	3	NE.	26	3	W.	26	3	SW.	26	7	SW.	26	4	W.	26	0	W.
27	6	E,SW.	27	4	NW.	27	4	N.	27	3	W.	27	1	SW.	27	4	SW,NW.	27	1	NW.	27	3	E,SE.
28	5	SW.	28	4	NW.	28	6	W.	28	2	W.	28	3	SW.	28	5	W.	28	0	N,E.	28	2	W,NE.
29	4	SW.	29	3	NW.	29	5	W.	29	2	SW.	29	4	W.	29	6	SW.	29	1	E.	29	3	W.
30	5	SW.	30	4	NE.	30	4	W.	30	2	SW.	30	4	NW.	30	5	SW,	30	2	SE.	30	6	E.
31	3	W.				31	4	E,S,E.	31	6	E.				31	5	W.				31	1	N.E.
Mean: 4.5			Mean: 4.4			Mean: 4.3			Mean: 3.4			Mean: 3.6			Mean: 3.			Mean: 2.3			Mean: 4.6		

HENRY COOPER KEY.

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TABLE IV.—RAINFALL FOR 22 YEARS

(1818 TO 1842),

Recorded by the late Capt. PENDERGRASS, at Pool Cottage, Dewchurch, 4½ miles nearly South of the City of Hereford, on the West side of a hill, the aspect W.N.W., and about 400 feet above level of the River Wye at Hereford bridge.

Years.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	Winds as at Noon.—True Bearings. No. of Days Wind blew from the several quarters.							
														E.	W.	N.	S.	N.E.	S.E.	N.W.	S.W.
	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.								
1818	2.20	1.62	1.52	5.81	2.34	1.43	1.22	0.52	2.94	2.67	4.20	0.82	27.09	15	33	19	65	68	26	35	102
1819	3.64	3.66	1.05	2.30	3.63	2.51	1.54	0.88	2.04	1.63	1.65	2.25	26.78	7	30	42	41	69	31	47	96
1820	2.67	1.37	0.57	1.22	2.78	1.01	2.35	1.76	1.15	4.38	1.80	1.67	22.43	15	58	32	54	66	18	33	90
1821	2.23	0.42	3.66	2.81	1.32	1.55	3.67	2.75	4.38	2.53	3.85	6.04	35.21	19	66	29	60	48	18	27	98
1822	0.72	2.29	1.37	2.97	1.55	0.40	5.04	1.72	1.39	5.71	5.38	1.72	30.26	25	58	26	49	64	15	25	103
1823	3.74	2.97	0.91	2.36	2.21	1.47	4.33	3.08	1.18	5.07	2.11	4.42	33.85	26	58	47	39	44	14	26	111
1824	0.45	2.95	2.19	1.55	1.28	3.81	1.33	1.98	3.48	5.57	3.66	4.01	31.76	25	64	42	52	54	16	40	73
1825	0.94	0.92	1.94	2.02	2.18	1.31	0.38	3.25	1.96	2.86	3.12	3.73	24.56	15	58	43	65	61	24	43	56
1826	1.97	4.34	1.94	1.04	1.38	0.03	1.44	1.34	4.72	1.99	1.54	3.60	25.33	18	49	44	57	65	29	42	61
1827	1.43	0.76	3.58	0.60	2.40	0.78	1.78	1.49	3.17	3.18	2.56	5.28	26.96	31	54	27	29	56	37	39	92
1828	4.86	2.14	0.92	4.23	4.16	1.59	4.85	3.26	3.32	2.50	1.92	4.30	33.05	19	52	24	47	48	49	37	90
1829	0.74	1.53	1.31	4.81	0.83	3.82	5.42	4.19	4.20	1.10	0.63	0.66	28.74	30	46	50	33	73	31	45	57
1830	1.36	1.48	0.63	3.70	2.98	4.68	2.84	2.91	3.41	0.53	5.03	3.32	32.87	24	56	29	50	41	35	40	90
1831	3.06	2.43	2.75	2.83	1.65	1.50	3.80	1.14	3.31	5.45	1.68	5.18	34.28	18	36	29	52	53	42	51	84
1832	1.12	1.06	1.88	1.22	2.37	3.60	1.03	4.41	0.75	3.56	3.97	1.87	26.84	19	45	41	73	54	40	33	61
1833	0.67	6.86	1.55	2.46	0.80	3.59	1.49	0.71	1.87	3.44	2.24	2.95	28.63	33	60	37	52	44	24	44	72
1834	5.33	1.05	0.54	1.61	1.35	1.91	7.49	3.19	2.06	1.24	2.16	1.16	29.09	19	27	27	63	75	31	31	92
1835	1.18	3.17	2.64	1.00	3.04	2.74	2.01	2.02	4.22	4.79	4.80	0.52	32.13	18	65	33	50	52	42	41	64
1836	1.92	1.34	4.65	2.70	0.41	1.47	2.71	1.93	2.31	3.63	4.41	3.11	30.59	19	69	27	59	45	12	35	110
1837	3.33	3.74	1.37	1.58	1.14	2.17	2.32	4.67	1.99	2.64	2.09	3.10	30.13	15	60	50	60	71	23	14	72
1838	2.45	3.40	1.48	1.88	3.84	5.59	1.48	2.16	1.80	2.89	6.81	2.36	35.64	23	47	30	55	79	22	38	71
1839	1.28	1.35	2.09	2.08	0.97	5.56	5.92	2.66	5.57	4.12	5.88	3.15	40.63	16	65	30	68	65	36	26	59
1840	3.55	2.81	0.05	0.53	2.15	2.07	1.17	1.47	2.22	2.11	6.24	0.33	24.70								
1841	3.72	2.87	2.98	1.87	3.58	2.58	1.99	3.70	5.80	3.35	4.45	2.99	39.78								
1842	2.94	1.87	2.70	0.21	2.43	2.29	2.36	1.99	3.56	1.06	7.38	1.11	29.90								
Totals	57.50	58.40	46.27	55.39	52.17	58.91	69.41	59.18	72.80	77.50	89.26	69.15	766.23	439	1156	1758	1178	1295	615	792	1804

JAMES PENDERGRASS.

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TABLE V.

HEREFORD RAINFALL DURING 14 YEARS,

(1826 to 1840)

REGISTERED BY THE LATE HENRY LAWSON, ESQ.,

AT ST. OWEN STREET, HEREFORD.

1826	23·378	inches.
1827	21·930	,,
1828	31·230	,,
1829	25·498	,,
1830	29·319	,,
1831	31·033	,,
1832	25·234	,,
1833	25·338	,,
1834	(lost)	
1835	29·276	,,
1836	28·168	,,
1837	26·207	,,
1838	27·643	,,
1839	34·404	,,
1840	21·381	,,
	380·039	,,

Mean of 14 years and average for Hereford, 27·145 inches.

[*Reprinted from the fourth Annual Report of the "Herefordshire Natural History, Philosophical, Antiquarian, and Literary Society."*]

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TABLE VI.

RAINFALL AT TITLEY, in the County of Hereford, during the 12 years from 1841 to 1852 inclusive, recorded by the late R. B. BODDINGTON, Esq.

	1841	1842	1843	1844	1845	1846	1847	1848	1849	1850	1851	1852	Tolal.	Average of each month
	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.	I. H.
January	0.56	1.77	3.24	1.56	2.71	3.12	3.01	0.54	3.10	1.78	5.22	5.57	32.18	2.68—2
February	1.10	1.38	2.78	2.97	0.96	1.41	1.25	4.23	1.28	2.07	0.44	2.70	22.57	1.88—1
March	2 42	3.95	1.55	4.02	1.27	2.25	1.97	3.15	1.09	0.82	4.15	0.40	27.04	2.25—4
April	3.00	0.32	3.52	0.43	1.80	3.67	1.79	3.24	3.57	4.19	1.58	0.60	27.71	2.30—11
May	0.92	2.72	4.33	0.18	1.40	2.08	3.05	0.77	2.59	1.70	1.14	1.83	22.71	1.89—3
June	2.30	5.15	3.78	0.83	2.43	3.01	1.48	5.18	0.72	0.85	1.37	4.88	31.98	2.66—6
July	2.05	2.47	2.29	2.30	3.50	2.80	1.57	2.65	1.97	1.58	3.57	2.26	29.01	2.41—9
August	5.64	0.90	2.18	2.44	3.55	3.40	1.37	5.46	1.23	1.74	1.68	5.66	35.25	2.93—9
September	5.13	2.80	0.56	2.11	3.02	1.52	2.20	2.39	3.67	0.65	0.75	2.49	27.29	2.27—5
October	3.65	1.18	6.28	2.55	1.80	4.89	4.65	5.09	3.78	1.95	2.03	3.18	41.03	3.41—11
November	4.91	6.37	3.71	3.23	3.15	2.08	1.73	1.34	2.10	3.14	0.55	9.52	41.83	3.48—7
December	3.33	4.37	1.25	0.97	4.10	0.54	5.92	3.81	3.28	2.23	2.10	4.44	36.34	3.02—10
	35.01	33.38	35.47	23.59	29.69	30.77	29.99	37.85	28.38	22.70	24.58	43.53	374.94	31.24—6

General average of the averages, 32.02—4.

During the 10th and 11th of November, 1852, 2in. 80h. fell in twenty-six hours, and with the exception of the 23rd, 25th, and 30th of that month, and the 2nd, 5th, and 7th of December, rain fell more or less every day throughout those months.

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TABLE VII.

RAINFALL AT ROCKLANDS—By J. M. HERBERT, Esq.—Gauge about 50 feet above ordinary level of river, and 1ft. 11in. above the surface of the ground.

	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.
January	—	3.81	2.87	.29	3.18	2.12	.44	1.46	4.75	.81	3.00	4.82	1.47	3.75	5.64	5.15
February	—	.86	.89	1.22	2.78	1.40	1.27	1.65	.66	4.46	.96	.94	1.34	2.07	3.23	2.52
March	—	.89	.68	1.79	1.60	2.32	.87	2.85	3.02	2.73	4.98	1.27	3.29	.88	3.03	4.77
April	.38	1.80	.34	.60	3.06	2.49	4.72	3.21	1.37	.66	2.73	1.80	.88	.51	2.26	2.93
May	1.89	3.08	2.48	3.41	2.95	1.66	2.32	1.37	3.27	1.39	3.94	.75	.84	2.42	.96	3.34
June	5.37	3.55	1.96	2.68	1.24	1.46	.99	2.26	7.12	2.48	3.81	4.27	1.51	1.60	2.39	1.09
July	2.87	4.68	3.54	3.93	1.32	2.22	1.50	1.92	1.70	6.56	2.19	.71	.84	3.15	1.54	2.75
August	4.78	2.55	.67	1.60	5.57	3.23	2.47	3.40	4.95	.65	1.72	2.87	.82	4.01	3.28	1.80
September	3.00	2.07	1.23	2.41	3.19	2.27	1.97	3.91	2.85	2.51	4.37	4.13	2.91	.06	8.50	1.73
October	4.04	3.90	2.40	4.42	2.64	3.94	4.03	2.86	2.17	2.41	4.39	4.00	2.38	5.52	2.56	3.52
November	9.48	2.05	1.66	.70	.70	2.35	1.02	4.32	3.52	3.72	.93	2.38	3.95	4.38	1.95	1.18
December	4.36	.95	.70	2.07	4.33	.72	2.44	4.32	5.39	3.53	2.25	1.38	2.05	4.09	1.83	.77
Total	36.17*	30.19	19.42	25.12	32.56	26.18	24.04	33.53	40.77	31.91	35.27	29.32	22.28	32.44	37.17	31.55

* Only nine months.

The average rainfall of the 14 years preceding 1867 was 30.05 inches.

JOHN MAURICE HERBERT.

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At the request of the President, the following paper was then read :—

ON THE PROPOSAL TO COPY AND PUBLISH THE HEREFORD MAP OF THE WORLD.

By THOMAS BLASHILL, Esq., Vice-President.

At our last annual meeting Sir William Guise called attention to the ancient *Mappa Mundi* in Hereford Cathedral, and offered a handsome subscription towards its reproduction by means of photography or engraving. Our President, Mr. Chandos Wren Hoskyns, supported him, and, as other members volunteered their assistance, it was understood that the subject should be further considered by the Club.

This map has been the subject of much curiosity and of some study during many years, nevertheless, no complete critical examination of it seems to have been undertaken. Upon the formation of the museum of the Royal Geographical Society, some years since, a copy was made, and this copy was itself copied in 1841 for the *Bibliothèque du Roi*, in Paris. From this last copy were executed lithographs which caused considerable interest amongst French geographers. The late Dean Merewether had written a paper upon it for the Hereford Literary and Philosophical Society, and in 1845 Mr. Thomas Wright, M.A., read a paper before the British Archœological Association, at the Gloucester Congress. In 1861, Mons. D'Avezac, of Paris, who is a distinguished French geographer and member of the Institute, read a paper upon it before the *Société de Géographie*, and visited Hereford last summer for the purpose of examining the original. Having a previous acquaintance with him I had an opportunity of hearing his opinion of it upon his return from Hereford, when he presented me with his paper which was translated and published in the *Gentlemen's Magazine* for May, 1863, by the Rev. G. Fyler Townsend, late Vicar of Leominster.

I may state that the result of Mons. D'Avezac's very ingenious inquiry is to fix the date of the map, in his opinion, at about the beginning of 1314; an opinion which probably will not be received without dispute, but it is certainly of importance. The time seems to be now favourable for promoting a thorough examination of the map and for the collection of all the evidence that bears upon its history. It is extremely difficult to examine the map in its present position—the Cathedral—which indeed is hardly a fitting place for such an undertaking. I have reason to believe that the London copy (and, by consequence, the French one) is not a perfect *fac simile* of the original. The first requisite therefore for a complete study of the subject is the production of a true copy that can be placed in the hands of persons well versed in such different branches of knowledge as may be expected to throw light upon the

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question. For it must be remembered that it is not alone to be approached from the side of geography and history. There is the important question of handwriting, and there is also much matter for study in the grotesque representations of men and animals with which it is illustrated These are of the class which prevails in our early manuscripts and printed books, and since they bear about the same relation—partly fabulous and partly speculative—to natural history as the chart itself does to geography, there is considerable fitness in the introduction of the subject to the Woolhope Club.

From my own experience of the different methods of reproducing drawings, I am of opinion that the work should be done by an eminent lithographer, who would be able to produce almost the exact appearance which it had when it was newly drawn upon the vellum. A photographic copy, though more picturesque, would be of much less practical utility. I should also say that Mons. D'Avezac is engaged upon a work on the ancient mappe-monds, I believe "A treatise on the History of Geography in the Middle Ages," taking the Hereford map as his leading example. Mr. Thomas Wright, whose studies of the grotesque elements in Mediæval art are well known, is also preparing a notice of the map in that particular point of view. No doubt other enquirers will have something to say about it if we can furnish them with the means of study.

I have been induced to bring this statement before the Club in the hope that a sufficient amount of interest may be caused in the subject so that the offers so liberally made at our last annual meeting may find a fitting response.

The Rev. F. HAVERGAL remarked that he was glad to see this subject brought before the members of the Woolhope Club. As this map is unquestionably one of the most remarkable productions of the middle ages, he thought that its importance could not easily be estimated too highly. Having taken a practical interest in it for the past fifteen years, both as to its restoration in 1855, and as to its being placed in a position at all times accessible to visitors since 1862, he had also endeavoured to decipher its contents and trace its former history. Their production of this map in the best style would, he felt sure, be extensively supported by geographers, antiquarians, and other literary persons. He quite agreed with Mr. Blashill, that although the reproduction could be accomplished by photography, yet the result would be far more satisfactory by lithography. Two years at least would be required for this work, and a subscription list of not less than one hundred guineas must be first procured. He had laid the subject before the Dean and Chapter, who readily gave their consent to the proposal. He would also be happy to obtain the best advice on the subject, and lay the result before the members of this Club on some future occasion. The only copy of the map was made in 1831. This is now in the possession of the Royal Geographical Society, but is far from being trustworthy. A small portion of the map was also published about 20 years ago. No other attempt has been made to reproduce this most important map in the manner

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it deserves. He concluded by saying that, with the co-operation of others who took special interest in ancient geography, he would next year be happy to take an active part in the reproduction of this very important map—a work involving considerable research and skill. Judging from the large amount of interest taken in this matter, he had no doubt that ample funds would be forthcoming when wanted.

Some little discussion then took place with reference to the best means of proceeding to obtain accurate copies of the map; which ended in the acceptance of Mr. Havergal's suggestions, with the request that he should proceed to carry them out, and with the promise, moreover, that when he had done so, the members of the Club would render him every assistance in their power.

[The President now read his "Retiring Address," which forms the introduction to the present volume—pp. i. to x.]

The next paper read was—

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A REPORT ON THE TREES OF HAREWOOD AND PENGETHLEY.

BY A COMMISSIONER FROM THE WOOLHOPE CLUB.

[*N.B.—The circumference of the trees is always taken at 5 feet from the ground when not otherwise specified; and it will save repetition to remember that the figures given, always refer to feet and inches.*]

The excellent photograph which forms the frontispiece to the present volume of Transactions, represents the "Home Oak" at Harewood, with the House in the distance. On the bole of the tree you will see the card of the Club. It measures exactly one foot long by six inches deep, and from the dark line across its centre to the ground level is exactly five feet. With this scale and a pair of fine compasses anyone can readily measure the tree with tolerable accuracy. The bole at 5 feet—where the card is placed—measures 16 feet 10 inches in circumference. The height of the tree will be found to be 90 feet; and the spread of its branches, as seen from this aspect, nearly due north and south, is 110 feet. The "Home Oak" is already a noble tree, and in its present luxuriance and its future promise, is certainly one of the finest trees in this county. Examine the photograph still more closely. Take a magnifying glass of good defining power, and you will find in the figures beneath the tree, exactly the people you would expect to be there.

Before introducing you, however, into the leafy oasis of Harewood, it will be better to make some general remarks on this district of the county. The last thirty or forty years has made a difference in the landscape that at first sight would scarcely be credited. If we may borrow a term from our geological pages, a "denudation" of timber has taken place. Not alone have hedgerows vanished under the modern fiat of enlarged enclosures, but whole masses of coppice and plantation are gone; of woody knolls, and deep glen-like "roughs," which helped to give that alternation of tangled intricacy and open glade which forms the most romantic expression of country scenery. The rich red soil remains indeed, mellow and beautiful in its very bareness, laid out in wide and open fields scored industriously with as straight a furrow line as may be seen in many a better farmed district of England; but the old dress that once formed the predominant feature, the

"Boundless contiguity of shade"

is gone, and probably never to re-appear—never, at least, so long as population thickens at home, and the forests of distant lands can float their tall burthens to our shores at less cost than our own soil can afford to grow them, to the displacement of the more prosaic but necessary acres of wheat, and barley, and turnips.

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The change is great indeed and startling, but the explanation of it is to be found in a cause no less complimentary to the district than the noblest hedgerow of forest timber that could decorate the landscape, namely, the admirable quality of the soil itself, whose only fault is so responsive a relation to the plough as scarcely to admit of application to woodland, or even to pasture, except for ornament or waste. But, happily, here and there some vestiges remain of the ancient home scenery not cut down to the standard of modern requirements. As the woods of Pengethley and Harewood, which once formed adjoining parks,* rise upon the view, the old pastoral and sylvan character is still brought to mind; and if the rich quality of "the Ryelands", as this part of Archenfield was once called, satisfies the eye of the agriculturist in its fertile adaptation to tillage, the lover of woodland scenery will find ample cause of pleasure in the groups of noble forest and ornamental trees that still flourish here, many of them very beautiful and picturesque, and some of them presenting a very unusual size in girth and extent of foliage. (See note.)

On entering the Lodge at Harewood from the turnpike road, through the shade of the beeches and chesnuts, the age and character of the trees in the park cannot fail to strike every one; and in the drive through the undulating grounds to the house there is, perhaps, as much of picturesque beauty, and as much variety of form and foliage, as can be found anywhere in the county in the same space of ground.

The first tree to be inquired for is the well-known oak, which stands in the front rank of Herefordshire trees of note, the "Harewood Oak" *par excellence*. Its local name is "the Garden Oak," from its situation in a hollow slope of ground near the garden. This fine old tree is spoken of as "the Great Oak" in some letters upwards of 240 years old in the possession of the family. It is now considerably past its prime, and shows extensive signs of decay. The tree is so well proportioned that the eye scarcely forms an idea of the magnitude of its bulk in stem and branch until you are close upon it. It measures, at 5 feet from the ground, exactly 23 feet 9 inches in girth, extending to 36 feet just below the spring of its branches. The tree was very much injured by an intentional kindness. The late Sir Hungerford Hoskyns, Bart., had a manure heap placed near the stem some 35 years ago, with the view of benefitting it. Perchance Sir Hungerford saw the evil commencing and wished to arrest it, but be this as it may, every one could see but too plainly the first decayed branch which appeared on the south side the very next summer; and from that time the progress of decay has been rapid, and now many other branches are dead. The photograph opposite gives a very fair representation of it.

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* "The Parks of England," by J. Evelyn Shirley.

[NOTE.—The ancient title of this district—"the Ryelands"—gave its name to a delicate and pure breed of sheep, in many points resembling the Spanish Merinos, and from which it is possible they may be descended.]

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THE REMARKABLE TREES
OF
HEREFORDSHIRE.

THE HAREWOOD OAK *(Q. pedunculata).*

APRIL, 1867.

This noble old tree is situated near the garden wall at Harewood (Chandos Wren Hoskyns, Esq.) It is considerably past its prime, and several of its branches—especially to the south and west—(from whence this view is taken) are dead and bare. The trunk is still perfect in circumference ; but about 35 years ago, the late Sir Hungerford Hoskyns, Bart., had a manure heap placed around the stem, with the view of benefitting the tree. From that time the branches began to decay, and fungus growth, rapidly to shew itself in the trunk. At 5ft. from the ground, where the card is placed, it measures 23ft. 9in. in circumference.

(Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.)

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"The Harewood oak" in its mode of growth, supports the theory brought forward so ably by our Vice-President, Mr. Key, as to the true type of the *Quercus pedunculata*. The bole separates at one point into its numerous branches,—that is, it has the pollard form of growth—as distinguished from the form in which the stem is prolonged upwards, and the several boughs are given off at different places, forming a central axis as it were, which Mr. Key maintains is the true type of the *Quercus sessiliflora*. The oaks at Harewood, however, do not generally support this theory. Two pedunculate varieties on the rise of the bank, measuring 15.5 and 14.2 respectively, are certainly not pollards. In the young "Home oak," as has been seen, the stem is prolonged upwards; and in the neighbouring beech grove there is a curious tall stripling of *Quercus pedunculata*—measuring only 6 feet 4 inches in girth—which realizes well the adage, "Tell me your companions and I will tell you what you are." In rivalry with the beech trees it towers to the height of above 80 feet, with short branches on the side towards the light and a tapering bole, as tall and straight as a fir tree. Then again on the other hand, the specimens of the true *Quercus sessiflora*, measuring 11.8; 8.2; with many smaller ones, are all, with one single poor exception, themselves perfect examples of the pollard form of growth.

The middle of the park is thickly scattered over with single trees, and chiefly oaks and sweet chestnuts, to an extent that would be monotonous were it not that their symmetrical outlines, repeated again and again, are relieved here and there by the yews, and thorns, and ash, and other trees, planted together to conceal, here, an old stone quarry, or there, a pond or a worn out gravel pit, thus producing the deep shade that imagination revels in.

It is never wise to leave too many trees standing singly. Trees are like men—if left to have their own way in everything, they are rarely, very rarely, objects of pleasure to others. The trees may perhaps do their duty fully, strike out roots on every side, and grow vigorously in all directions, but such uniform growth is not picturesque, and never can be, until size has added a grandeur that but few attain, until age has given respect, or a partial death has created sympathy. The history of a people, for the most part, is but the detail of the trials and calamities that have occurred to them, and is only the more or less interesting from the brave spirit and success with which they have been encountered: so the picturesque in trees chiefly results from the struggle of their vitality against adverse circumstances; from the efforts they make in the battle of life, by curious forms of growth, to obtain air, and light, or root space, to overcome injuries from storms, or to resist attacks from insects. "Happy is the nation," it has been said, "that has no history," and in this sense it is well said; but the proverb can never apply to the picturesque in trees. There is no moral drawback here, and thus the conclusion becomes definite, "Too many trees should never be planted singly where you wish to produce a picturesque effect."

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The prevalence of individual trees at Harewood is said to have been occasioned by a dislike entertained by the late Sir Hungerford, for "Browne's clumps," as he used to stigmatise them, alluding to "Capability Browne," an old landscape gardener of noted affectation, who strongly recommended this form of planting, the reaction against which, has spoilt the grouping of many an English park of timber.

The Beech grove just mentioned is near the old oak, and very fine it is. The trees are not very large: 9ft 9in., 9ft. 1in., 9ft. 10in., 8ft. 8in., 8ft. 7in., 9ft. 5in., 8ft. 3in., &c., &c., in circumference at 5ft. from the ground, yet they measure from 90 to 100 feet in height, and their tall straight trunks for the most part rise to a height of some 70 feet before giving off boughs, and their tops mingle closely together and form a dense, lofty, aerial shade that would be very attractive to wander beneath in summer were it not for the flourishing colony of rooks that thickly inhabit the trees. The beech trees near the lodge are more widely spreading trees, but measure nearly the same—8ft. 9in., 8ft. 11in., 8ft. 3in., 9ft. 8in., &c., in circumference.

Passing through the beech grove, some fifty yards away, is "the Echo tree," so called for a reason very responsive to any one who facing S.E. may make articulate trial of its capacity in this respect. It is a Spanish chesnut growing in the park opposite the front of the house: a very fine symmetrical tree, and remarkable, not for its echo alone, but for its growth and size, and the beautifully reticulated character of its bark. It measures 15ft. 4in. in girth, and has reached its full maturity.

There are other sweet chesnuts of great beauty and expression, scattered about the park: one on the right hand as you enter the park from the lodge 13ft. 5in. in girth, throws down some boughs to the ground, which have taken root, and are beginning to grow as separate trees. The others, too, make the most of themselves admirably, and one can scarcely believe the tape-string when it tells you that they are only 11ft. 10in., 11ft. 5in., 11ft. 4in., 10ft. 10in., 11ft. 1in., &c. &c. in circumference.

Beyond "the Echo tree" on the opposite bank—in clear view from the west front of the house—stands a group of three magnificent lime trees. They measure 14ft. 9in., 11ft. 6in., and 14ft. 6in. respectively, but their very great beauty consists in their foliage which, mingled together, offers the rounded contour of a single gigantic tree, and droops luxuriantly, almost concealing the stems, but yet allowing a very deep shade to appear in contrast with the light foliage under the brightest sunshine.

There are several good birch trees at Harewood, and some with a full share of the picturesque beauty that belong to this pretty graceful tree. One on the bank above "the Garden Oak" (8ft. 11in.), gnarled and knotted, forms, with a fine oak near it, a picture to move the soul of an artist. One near the entrance of the park is a very fine grown tree. It measures 8ft. 9in. in circum-

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THE REMARKABLE TREES
OF
HEREFORDSHIRE.

THE SCOTCH FIR *(Pinus Sylvestris)* HAREWOOD.

APRIL, 1867.

This tree, with one other still more picturesque, is the remnant of a former generation of Scotch Firs, which formed a double circle on the highest point in Harewood Park (Chandos Wren Hoskyns, Esq.) The card of the Club (1ft. by 6in.) is placed at 5ft. from the ground, where the circumference is 13ft. 6in. Its fellow tree measuring at the same height 11ft. 9in. The handsome trees forming the front ring were planted about 40 years ago by the late Sir Hungerford Hoskyns, Bart.

(Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.)

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ference. Its boughs hang down on all sides; their long slender shoots reaching nearly to the ground, and

"Half concealing, half revealing,"

the silvery bark of the stem within.

A little to the right of this tree, on the rise of the ground, a rampart is thrown up. It is formed by a short straight row of horse-chesnut trees (the largest 11ft. 2in. in girth). They seem to have known what they were wanted for. At once they throw out branches which sweep the ground, and uniting, form a dense barrier of foliage, impregnable to eyesight. Tunnel it, and pass under, to a space a few yards further on.

On the highest point of the park, not far from the entrance, is a very remarkable circular tree-enclosed space. It is slightly eliptical, and of some 100 paces in diameter. It is formed by a double row of Scotch fir-trees. Tradition gives no certain clue to its origin; but the existence at Harewood in olden days of a Preceptory of Knights Templars (afterwards Hospitallers of St. John of Jerusalem) affords full scope for conjecture. The spot, moreover, where this ring is situated, commands a view, amongst other points, of Garway Hill, where a prominent and well known group of trees indicates the scene of another Preceptory of the same order of *Knights Hospitallers*. Harewood and Dinmore were brother establishments with Garway, in this county, and all of them connected with the head-quarters of St. John's of Clerkenwell, in London.

Around this circular space are some very remarkable trees. The double ring of handsome young and growing firs which now surround it were planted by the late Sir Hungerford Hoskyns about 40 years ago, the finest of them measuring 6ft. 3in.; 5ft. 11in.; 4ft. 7in.; 5ft. 1in.; 5ft. 7in.; 4ft. 8in.; 5ft. 11in.; 6ft. 2in.; 5ft. 11in.; 6ft. 6in.; 5ft. 10in.; and 5ft. 10in.; at 5ft. from the ground.

But there are in the ring two trees of a former generation of Scotch firs which are very fine and interesting. The largest tree on the north side is represented in the photograph opposite: it measures 13ft. 6in. in girth. Its fellow on the opposite side measures 11ft. 9in.; but what the latter wants in size is amply compensated for by its very great beauty. Driven from its upright position by some violent storm, it has still kept its ground, and presents an object most strikingly picturesque on entering the park.

A single aged and dilapidated oak, still standing close to the present ring of firs, suggests the presumption of a still more ancient ring of trees; and this, too, is borne out by local tradition.

In Elm trees, Harewood shows nothing very remarkable. There are two tall, ivy-covered elms near the stables, which measure 13ft. 6in. and 11ft. 7in. respectively; and on the south lawn there is a handsome tree of 13ft. 7in. This tree has that peculiarity of the elm, "the bended knee," strongly marked in several boughs. One of the largest bends down from the trunk of the tree,

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and at some distance from it, turns suddenly upwards, and takes forthwith the full appearance and character of a separate tree.

On the south-east side of the house the pleasure-ground dips down suddenly in terraces to a charming dingle, fully open to sunshine, protected more or less from every unkind wind, and yet cool from the ornamental water below. In this sheltered spot is situated a very handsome and remarkable tree. It is the "Occidental Plane," very well grown, lofty and evenly balanced, dropping down its branches on all sides with peculiar beauty. It is of a very unusual size for this country; indeed, one of the three or four finest in the kingdom. At 5 feet from the ground it has a girth of 11 feet 6 in., a spread of branches 85 ft. in diameter, and a height of nearly 80 feet. The largest Occidental Plane in England is believed to be the one at Ribstone Castle, in Yorkshire, which has a girth of 14 ft., and a diametric foliage measure of 90 ft. This tree, however, is full grown and verging on decay, whilst the Harewood plane is still growing in full luxuriance, and bids fair soon to outstrip its northern rival.*

The finest Cedar of Lebanon grows at the south end of the house. It is seen on the right in the picture of the "Home Oak." It is a well grown tree, and measures 12 ft. 6 in. in girth. By far the most picturesque cedar, however, is the "Table Cedar," at the further end of the dingle. It is so called from its broad flat leaderless head, as you look down upon it from the terrace by the house. At all times this tree forms a beautiful object, and it is peculiarly so, when seen in the varying mists of early morning, when covered in autumn by its own clustering cones, or most beautiful of all, perhaps, when sprinkled with rime-frost or half laden with snow.

One other tree must be noticed here, and it owes the notice to its situation so much below the eye of the observer. It is a "Silver Fir" near the "Table Cedar," a fine tree and well grown, whose lower boughs sweep the ground, and the others follow suit in tapering succession as they curve gracefully from the stem. The "Table Cedar" measures 10ft. 9in. and the "Silver Fir" 9ft. 8in. in girth.

.....But here, tape in hand, all botanical enthusiasm is suddenly arrested by an object of interest, higher and holier in its associations than beauty of landscape or growth of tree. It is the gem of Harewood—the beautiful restored chapel of the Knights Templars. At the request of your Commissioner the following description has been very kindly given by our President, Mr. Chandos Wren Hoskyns, to whom belongs the entire credit of the restoration :—

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* NOTE.—At Lee Court, near Blackheath, is an Oriental Plane tree which is figured by Strutt in his "Sylva Britannica," and there stated to measure 14 ft. 8 in. in girth at 6 feet from the ground.

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THE CHAPEL OF THE KNIGHTS TEMPLARS AT HAREWOOD.

The present structure was erected in 1863-4 upon the site of the ancient chapel, whose time-worn foundations crumbled to sand as they were exposed to view in the process of rebuilding. The date of the original building is unknown. It is stated by Dugdale to have been granted with the lands around it to the Knights Templars. Their sovereign possessions throughout Christendom were accompanied by Ecclesiastical rights that brooked no rival, even in the growing power of the Papacy; and their successors the Knights of St. John of Jerusalem preserved the same independence wherever the lands they had held escaped division amongst different proprietors. Harewood, or as it is called in Domesday "Harewde," was one of the few that preserved their entirety, and thus retained its ancient immunities and exemption from Ecclesiastical jurisdiction. It was purchased soon after the restoration of Charles II., by Sir Bennet Hoskyns, of the former proprietor, to whom it had devolved after the dissolution of religious houses. From the number of skeletons found in the meadow below the chapel at the time of its restoration by the purchasers, it would seem that the cemetery was formerly much more extensive than at present. From that time the services have been supported, and it has been used for mortuary purposes by the successors of Sir Bennet. The architectural character of the original building had, in the course of repeated reparations, almost totally disappeared; and it has been rebuilt in accordance with its reputed style, corresponding with many of the Temple churches still existing, viz., Norman and Early English, under the designs of T. H. Rushforth, Esq., the architect of the beautiful little church of Welsh Bicknor, in this county. It is (with the exception of the groined ceiling) entirely of the old red sandstone, the interior lined with the stones remaining of the old church. Like other Temple churches it is without a chancel, the sacrarium being merely indicated by a step and a difference in the workmanship. The mortuary cloister forms a picturesque external feature, surmounted by cinqfoil windows above, which give the effect of a clerestory. The west end is in massive Early Norman style, pierced by two windows of stained glass, by Clayton and Bell, presented by Lord Justice Page Wood and Lady Wood, one (over the font) representing the Baptism in the Jordan, the other the subject of the text, "Suffer the little children to come unto me." Approaching the east end, the Early English style gradually prevails, terminating in three lancet-headed windows (the gift of Mrs. Hardman Philips, of Gwern Vale) by Messrs. Hardman and Powell, the centre window representing "Our Lord in glory," on either side "St. Michael triumphant over Evil," and the "Divine Healer." The lights are divided by triple shafts of serpentine, and surmount a massive string-course of alabaster. The feature of the interior is the groined ceiling, a masterpiece of geometrical workmanship, though the first work of the kind both by the architect and the builder (Messrs. Pearson, of Ross), on whom it reflects high credit. The bold ribs of the groins

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of hardest Forest stone span the roof at right angles and diagonally, while the bays worked in Bath stone, mellowed in colour by age, present the most delicate arch-work. The moulding over the sacrarium is after the pattern of the Temple Church in London. A white marble slab containing some curious inlaid lettering of bell-metal lies over the remains of Sir John Hoskyns, one of the founders, and an early President of the Royal Society.

Beyond the chapel, the little valley stretches away to the east, and a drive of a mile and a half through the estate, leads to Hoarwithy. And here, by virtue of the power given in his charter from the club, "to find a fault wherever he could suggest a remedy," your Commissioner boldly proclaims the left side of the valley wanting in beauty, and he takes exception moreover to an obtrusive corner of a certain field squared to agricultural perfection; and he recommends the planting forthwith, high on the bank, in the middle distance, of a cluster of five young plants of *Wellingtonia gigantea* some 20 feet apart, with a few larch between them for spring effect. Let them be got young and therefore easily moved; let them be well and carefully planted, not stuck in a hole; let them be well protected and weeded, and in a very few years, for the grow rapidly, they will repay the care bestowed upon them and redeem a blank feature of Harewood Park.

This tree, the *Wellingtonia*, be it observed, is peculiarly suited to Herefordshire. It likes the deep, heavy loam of the old red sandstone, and will grow and flourish in a situation where many another of the Coniferæ would but linger out a miserable existence, or speedily die outright. It is beautiful when young, and when old it is charmingly picturesque. In age—pictures tell us—it resembles somewhat the appearance of the Scotch fir—with its tall bare stem—though taller and straighter—and its branching head; and like this tree, too, it is more picturesque in groups than as a single tree. It is perfectly hardy; is the tree of all others to stand against wind; and, from its thin pliant foliage, it is not so likely as any other, to suffer from the weight of snow. As an ornamental tree in every stage of growth the Wellingtonia is of great value. As a timber tree it is useless. The wood grows much too rapidly to be otherwise than poor and soft. Oh Herefordshire owners of hilly parks and pastures, if you wish to add a picturesque feature to your favourite landscapes, plant Wellingtonias in groups on the high points of the middle distance; or wanting in high points, if the view is too flat, plant double the number of Wellingtonias on the dullest side of the landscape, and if the soil is rich as well as strong, you will soon get there a very prominent object indeed.

In this same square arable field, however, is a small tree of a very interesting character. It is a Canadian poplar, remarkable for the quantity of mistletoe it bears. It is a thoroughly mistletoe-possessed tree, and several of the fine large bunches are well seen in the photograph taken by Mr. Ladmore. To count the

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number of places in the tree from which the parasite springs would be a task pretty much on a par with the effort to unravel the mystery of a Chinese puzzle. Your Commissioner got to the number thirty-five, when he became entangled in the branches and was obliged to give in.

There are many Yew trees lending their dark shade to the park scenery at Harewood. Some of them are very old, and one in the clump concealing the stone quarry, measures 13 feet 7 inches, and another there 9 feet 3 inches in girth, but they are not generally of large size.

In the neighbouring churchyard of Llandinabo is a Yew tree, centuries old. It has withstood countless storms, and been torn and cropped by generations upon generations of men. It is a sound old tree all the same, and measures at two feet from the ground not less than 22 feet 4 inches in girth. It cannot be measured fairly above this height, since it is surrounded on every side by an abundance of thickly growing twigs. A tree of apparently the same age grows on the other side of the churchyard, and it is nearly as large, but its boughs starting from the ground have prevented the possibility of any accurate measurement.

In the churchyard of Much Birch is a perfect trunk of a fine old Yew tree, measuring 18 feet 9 inches in circumference. It still bears some small living branches on the north side, but the top is all gone, and on the south side, about ten feet from the ground, an elder tree—some three or four feet in circumference—shoots out and flourishes luxuriantly.

A walk through the grounds at Harewood in the early morning of a fine spring day leaves behind it the most pleasurable recollections. The freshness and brightness of the morning air, the clearing off of the slight mist remaining from the dew, the singing of birds, the cheerful noise from the rookery, the fetching home the cows to be milked, the departure of men and horses fresh for the labour of the day, and the hundred other of those pleasant rural sounds and sights which meet one everywhere in the country, are here to be found in perfection, and added to them, the lights and shadows on trees and groups of trees picturesque in themselves, and planted and pruned for their picturesque effect.

Your Commissioner left Harewood about 9 o'clock. His companion pulled up the open carriage he was driving to a foot pace at the "Home Oak," and to a dead stop opposite the grand old tree, a hundred yards off the drive. How much a well-proportioned tree conceals its size! Could it possibly be eight feet in diameter? It seemed not, but happily just at that minute a farmer on horseback chanced to ride under the tree, and in front of the bole. It was a moment for silence, as he, and his horse from head to tail, were easily included in the out-line of the trunk as in a picture frame! On again went the carriage, its occupants convinced and contented, rejoicing once more by the way, in the happy effects of light and shade, of form and foliage in the trees, that, whenever the sun shines, awaits the visitors at Harewood.

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THE TREES OF PENGETHLEY.

Pengethley is situated about a mile and a half south from Harewood, and very tempting and umbrageous the grounds look from the high road. Your Commissioner has never visited them, nor, indeed, are there any very remarkable timber trees there. A fine grove of growing oak trees it is said, good some elm and ash trees, and some beautiful specimens of the Coniferæ, but nothing of great size.

The absence of large trees seems explained when it is remembered that the Colonel Symonds of the last generation was a member of Parliament for 23 years in succession. He represented the city of Hereford from the year 1796 until his death in 1819. He was elected five times, and on the last occasion, the year before his death, in 1818, he fought a long struggle successfully. Let entomologists say what they please as to the great ravages of the *Zeuzera Æsculi* (1), the *Lucanus cervus* (2), the *Dorcus parallelopipedus* (3), or other insects, but beyond all question the *Æstus politicus* is infinitely more fatal than any of them in its effects on timber trees. A contested election often cuts off all the finest and soundest trees on an estate with one fell swoop, and whole centuries are sometimes required to restore the effects produced by its insatiable demands.

This may be the explanation here, or it may not; deponent is unaware. Certain it is from all accounts, that if wanting in size there are still trees of interest and beauty there, and some very remarkable ones too in the district, which have not yet been mentioned in this Report. Colonel Symonds has kindly sent an excellent account of them to the Honorary Secretary of the Club, and from his measurements in 1866 the following Report is chiefly drawn up.

The *Oaks* at Pengethly are comparatively young trees. There is, however, one—a mere shell—with a circumference of 17 feet 3 inches, and another tree of 17 feet girth, very aged and of no value as a timber tree. In the Craddock Wye meadows, Sellack, are two sound, healthy trees, the property of E. Caddick, Esq., which measure respectively 18 feet 4 inches and 16 feet 9 inches in circumference, at 5 feet from the ground; and in Sellack parish there are perhaps a score more trees exceeding 12 feet in girth. In the Foy meadows is an oak, that Mr. Wilton, the rector of Foy, reports as measuring 23 feet 3 inches in girth. The largest oak at Lyston is 14 feet 9 inches in girth.

In the Wilton meadows, opposite the town of Ross, on the Guy's Hospital property, is the shell of an old oak, which measures 29 feet in circumference. It is hollow, however, and has a wide opening from top to bottom, so that this large measurement cannot be implicitly trusted. It was set on fire about 12 years since, and now but a few small branches remain alive. The tree is especially

(1). The Leopard moth.
(2). The great Stag beetle.
(3). The small Stag beetle.

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interesting for a very different reason. It affords evidence of a considerable change in the course of the Wye. Common tradition certainly, and, it is said, an old map of the time of Queen Elizabeth represents the tree as standing on the bank of the river. It now stands in the middle of the meadow, around two sides of which the river runs at a distance of from 200 to 300 yards from the tree. The successive additions of land to the meadow may be clearly traced out on its surface; but they are perhaps most distinctly to be seen when there is a little snow on the ground, which has drifted from the north or east.

There is a fine *Elm* at Pengethley—the small-leaved English Elm. It has a girth of 15 feet 7 inches, and a spread of 60 feet of foliage. The tree leans considerably, and has been lightened by the removal of several branches. At Court farm, Foy, is a very remarkable elm with a circumference of 20 feet 5 inches. At Wilton, in Bridstow parish, there is a fine group of seven trees, with a girth as measured by Wyndham Smith, Esq., of 13.2,—12.2,—14.4,—13.8, —12.7, 14 feet, and 14 feet respectively.

There is a *Wych Elm* at Pengethley—a sound, healthy tree—17 feet 3 inches in circumference, dividing at once into many fine upright branches, as if it had been "stoggled" at some early period of its existence; and Col. Symonds also notices the fine tree at Lyston, the property of the Rev. D. Capper, which measures 16.10 in girth, and whose branches spread out horizontally to a diameter width of nearly 100 feet.

A *Lime tree* at Pengethley measures 14.5 in girth with a N. and S. diameter spread of 75 feet of foliage. Another at Whitchurch measures 14.7 in circumference. A group of Lime trees at Lyston (The Rev. D. Capper) cannot fail to catch the eye and admiration of every lover of trees who passes along the old Hereford and Monmouth road. There are four trees standing on a fine knoll near the house and above the road. They stand about 21 feet apart, and are not individually of great size (10 feet 10 inches, 9, 10.9, and 10.8 respectively), but they form together a beautiful group, with a diameter spread of foliage of 100 feet North and South, and 91 East and West. The trees are in full luxuriance, and though the misletoe is very fond of a Lime tree settlement, not a particle was to be seen upon them until 1866, when a small spray appeared on the Western side.

The largest *Beech trees* at Pengthley measure 12.8 and 9.7 in girth—and a couple on the banks of the Wye at Whitchurch measure 14 feet 7 inches and 12.7 respectively.

An *Ash* at Pengethly, sound and healthy, measures14 feet 5 inches in circumference. This tree divides at 20 feet from the ground into three branches which carry up their size to a great height.

At Craddock there is rather a remarkable row of *Sycamore* trees—some 20 in number. They are tall trees, and the two measured showed a girth of 10 feet 4 inches and 9.3. They stand on a very exposed bank and show well the characteristic obstinacy of this tree in never having yielded an inch to the violent gales to which they have been exposed.

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In Hentland churchyard is a Yew tree which is very interesting, from the fact of its age being known. The Parish Register contains this notice:—

"Md.—That the Yew tree between the Bell house and the stile was given by Philipe Swayne of Daviston: at the request of John Nurse curate of Hentland, and was removed and transplanted in the churchyard there upon Shrove Tuesday, being the 13th day of ffebruary Anno Dom. 1615. 1615. 1615."

The "Daviston" is, doubtless, the neighbouring farm of "Dason" of our day. The tree remains in the same place, and the stem now measures at the ground level 12 feet in girth, and at 5 feet, 9 feet 9 inches. It is a growing healthy tree, rather tapering towards the top, and less dense in foliage than is common with the yew. It has evidently been the object of considerable attention, as it bears marks of careful pruning. From N. to S. its boughs spread 55 feet, and from E. to W. 48 feet. Supposing the tree to have been 10 years old when placed there, it is now 263 years old, and thus rather supports the supposition that the age of a yew tree may be known by allowing a century for every foot in diameter. About 200 yards east of the church, in Craddock land, is the shell of a yew tree of extreme age. It measures 18 feet 9 inches in circumference, and only a few small branches show any remaining vitality.

The most remarkable trees at Pengethley, are three *Spruce Fir trees*, which grow one near the farm-yard and the other by the drive leading to the house. For height of growth, for good balance, and for the regularity and perfection of their branches, these trees could not well be surpassed. The foliage droops down from the boughs in a very marked and graceful manner. Forty years ago, the late Mr. McIntosh, who superintended the laying out the gardens at Pengethley, noticed these trees as being some of the finest specimens he had ever seen. Mr. McIntosh afterwards became the manager of the grounds at Claremont and Dalkeith, and published several horticultural works. The trees are of no very great circumference, being 8ft. 9in., 7ft. 11in., and 7ft. 10in. respectively, but their boles taper very gradually, and their height cannot be less than 100 feet. They are still in perfect health, sound, and growing, and have not yet lost a single limb.

There is also a *Silver Fir* equally well grown. Its girth is 9ft. 10in. This tree is chiefly interesting from the fact of its age being known to a close approximation. The ground in which it stands was formerly the kitchen garden, and without trees. Between the years 1800 and 1804 it was made into pleasure grounds. This tree may therefore be said to date with the year, and be now 68 years old, or perhaps two or three years older.

Col. Symonds mentions also a plain tree 9ft. 11in. in girth, and one other tree of notable size, a walnut tree at Pencoyd which has a circumference of 12ft. at 5ft. from the ground.

POST SCRIPT, ON THE PRESENT VALUE OF TIMBER.

The importation of foreign grown timber; the use of iron for wood in the construction of ships and for other purposes; the absence of Government buyers

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from the county; and doubtless the general depression of trade during the last two years have all tended to reduce the value of timber to a lower price than has ever been remembered.

The following are now the ruling prices in the market for timber delivered in the City of Hereford :—*Oak*, 1s. 6d., 1s. 9d., 2s., and 2s. 3d. per square foot; *Elm*, 10d. to 13d.; *Ash*, 1s. to 1s. 1d.; *Sweet Chesnut*, 1s. 3d. to 1s. 6d.; *Sycamore* (large), 1s. to 2s.; *Larch*, 1s.; *Beech*, *Poplar*, *Birch*, *Alder*, *and Scotch Fir*, 8d. to 9d.

Dr. Bull, as representing the Central Committee, begged to propose a vote of thanks to the Commissioner for his excellent report. The committee were extremely glad to receive it, and he felt sure the members of the club would be equally pleased with it. If they could but obtain similar reports from other districts of the county, the club would possess a valuable record of Herefordshire trees at the present time. He wished neither to praise nor to omit to praise the Report lest they should form any opinion as to the absence or presence of "the Commissioner" himself at that meeting. He would rather make a few remarks on the note in it with reference to "the Ryelands" of Archinfield giving its name to

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THE RYELAND SHEEP.

(By Dr. BULL.)

The very interesting book just published by Richard Johnson, Esq., the Town Clerk (suddenly deceased as these pages pass through the press), "On the ancient customs of the city of Hereford," bears testimony to the value of the wool from Archenfield and its high breed of sheep in the beginning of the sixteenth century. The passage refers to certain "Statutes Merchant" still existing in the Records of the city, and is as follows:—"In the reign of Henry VIII. a wool merchant named Thomas Gibbons entered into a contract before the Mayor to deliver to Watkin Carreway and William Gynaght thirty stone of good and able packed wool of *the best veynes within Irchinfield* in the county of Hereford, to be tried by John Warnecombe, or such other person as the said Watkin or William should appoint for the trial of the wool, by the feast of St. Peter called Advincula." Two sureties entered into a bond to the amount of eighty pounds that Gibbons should fulfil the aforesaid agreement. Another dealer, John Lloyd, also agreed to deliver to Carreway and Gynaght "eleven stone of good and able packed wool *of the best veynes within Irchinfield*, and gave security that he would well and truly perform this contract."—(pp. 87 and 88). The exact date of these "Statutes Merchant" is the 3rd of Henry VIII. (1511).

The origin of the Ryeland breed of sheep is not known. The true Merino sheep may possibly have been specially introduced by some spirited agriculturist, or, as seems more probable, since they so soon took the name of the district, the introduction of the blood into Herefordshire was simply accidental. Be this as it may, in the light, warm soil of Archinfield they flourished admirably, and well rewarded the care bestowed upon them. "A singular custom in the management of sheep," says Lodge in his history of Herefordshire (1793), "has long prevailed in the Ryelands, which is that of housing them in cots during the night, as well in summer as winter." And this method of treating the Ryeland sheep was followed within the memory of agriculturists still living. It seems to point out their origin from a warmer climate, or to the delicacy of the breed, but of course many other reasons may also be given for it.

The Ryeland sheep were very small in size, whitefaced, and hornless, but without the peculiar "reeve" on the nose which is said to have been distinctive of the true Merino race. The ewes when fat weighed only from eight to eleven pounds, and the wethers from ten to fifteen pounds the quarter. In symmetry of shape, and in the flavour of their meat, they were superior to most flocks in England; whilst in the quality of their wool they were wholly unrivalled. The delicacy of its texture, and the silkiness of its pile, soon made it renowned, and gave at length an European fame to Herefordshire wool.

"Beautious Albion, since great Edgar chas'd
The prowling wolf, with many a lock appears
Of silky lustre; chief, Siluria, thine,
Thine Vaga, favour'd stream."—*Dyer's "Fleece.*

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The district of "The Ryelands" was not destined, however, to reap the glory of its sheep. About a century after the date of the "Statutes Merchant" just alluded to, Leominster was in the full zenith of its fame as the chief market for their wool. It is a curious and interesting question to ascertain why Hereford, or Gloucester, or Worcester, not to mention Ross, should not have gained this honour and profit. On looking into several authorities with reference to this point, and particularly into that well written interesting book, "The History of Leominster," by the Rev. George Fyler Townsend, M.A., it does not seem difficult to account for it.

Leominster formerly was a place of much greater relative importance than at the present time, chiefly from the possession of a Monastery with rich manorial rights, and partly, perhaps, from its situation on "The Marches." When Henry I. built the Monastery at Reading (1123) amongst other liberal gifts he attached to it, was the Monastery of Lempster, and by the same charter he gave to the Benedictine monks—of Leominster as well as Reading—"freedom from all gelt and toll and every other custom, by land or by water, in passing over bridges and seaports throughout England;" and other privileges equally great which do not concern us now. The monks, who in those days were not only the best agriculturists but the most active merchants also, were not slow to avail themselves of these advantages, and thus the market of Leominster became celebrated as early as the twelfth and thirteenth centuries.

In 1235 the monks obtained two other separate grants and charters, one from Waleran, Earl of Mellent, and the other from the Citizens of Worcester, again giving them freedom of "tolls, passenger money, and customary dues" for the towns of Worcester and Droitwich. In the latter deed "skins, raw hides, raw woollen fleeces, and woollen thread" were alone excepted—an exception in so usual a form that it goes far to prove that though Leominster then dealt in this ordinary produce of an agricultural district, there was no special celebrity for them at that time.

The neighbouring towns at length became jealous of these great commercial privileges, and on the joint remonstrance of Hereford and Worcester (1266) Henry III. changed the market day of Leominster from Saturday to Friday.

Leominster still flourished more or less under the monks during the next three centuries, until Queen Mary (A.D. 1554) granted to the citizens the Charter which gave them such large and extensive privileges. No mention in it is made of wool, but Leominster is spoken of as "the greatest market town within the county of Hereford," and that trade in wool must then have been commencing which was so soon to give it still greater distinction.

It is very probable, also, that cloth factories in the towns of the adjoining districts of Herefordshire, and also of Shropshire, may have had something to do with the creation of a great wool market at Leominster. At a later period we know that woollen factories did exist in Leominster itself, as well as in several neighbouring places.

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James I., on his accession in A.D. 1605, gave to Leominster a renewal of the original Charter of Queen Mary, which contained these words: "Whereas from that time (the date of the Charter, 1554) until now, the borough and town aforesaid has in a wonderful manner been growing and flourishing, as well in wealth as in population, and yet doth flourish: *we intending the better sale and dispersion of the fine wool produced in that neighbourhood* into different parts of our kingdom, and being persuaded that the assemblye of buyers and sellers of that commoditie there may be a great encouragement of the woollen manufacture in this kingdom, do grant to the bailiff, &c., to keep one other fair on the feast of St. Bartholomew (Augst 24th), or on the morrow of that day."

It would seem, therefore, that during the course of the sixteenth century the breed of the Ryeland sheep had spread from Archinfield through the county, or at any rate had been introduced very generally, and with very great success, into the neighbourhood of Leominster.

The comparatively modern mansion, and the estate called "The Ryelands," within a mile of Leominster, was in all probability named from the sheep which flourished so well there, since the land itself has not the light character of "the Ryelands" of Archinfield, and was not therefore specially adapted to the growth of rye, which is the ordinary derivation of this name. If this assumption is true, it gives very satisfactory testimony in favour of the Ryeland breed of sheep being established there.

"The wool of Leominster," says Mr. Fyler Townsend, "was at the height of its fame in the reign of James I. (1603—1625"). Camden, in his "Britannia," vol. I., p. 690, thus speaks of it: "The greatest name and fame that it hath this day (1617) is of the wooll in the territories round about it. 'Lemster ore,' they call it, which, setting aside that of Apulia and Tarentum, all Europe counteth to be the very best;" and from henceforth it was a fruitful source of allusion to the poets.

Drayton, in his "Polyolbion" (1613), thus writes of it:

"Lemster, for her wool whose staple does excel,
And seems to overmatch the golden Phrygian fell.
Had this our Colchos been unto the Ancients known,
When Honour was herself, and in her glory shone,
He then that did command the infantry of Greece
Had only to our isle adventured for this fleece.
Where lives the man so dull, on Britain's farthest shore,
To whom did never sound the name of "Lemster ore?"
That with the silkworms thread for fineness doth compare,
Wherein the winder shows his workmanship so rare.
As doth the fleece excel, and mocks her looser clew;
As neatly buttoned up as Nature forth it drew:
Of such in high'st account, and reckon'd here as fine,
As there th' Apulian fleece or dainty Tarentine."

Again in his battle of Agincourt where he blazons the several Shires, he says:

"A golden fleece fair Hereford doth wear."

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And Philips, in his poem on "Cyder," (1705) also says:

——— "Can the fleece
Bœotic or Tarentine compare
With Lemster's silken wool."

And some other poetic allusions might also be given.

On inquiring from an agricultural friend as to what was the character of the Ryeland sheep at the present time, he said that "such as they are, it is easily given. They are nice well-shaped, compact sheep, entirely covered with fine wool, legs, head, ears, and even to the eyes. They have short heads, short ears, short necks, short bodies, short legs, short wool, and indeed they are short in every way, except in coming to full weight and maturity, since they require two years instead of one before they are fit for the butcher. One of the best flocks of Ryelands in the county now," he added, "is to be found at Mr. Downing's, of the Lower Bogmarsh farm, Holme Lacey." This gentleman thinks this description about one-third too long in its allowance of time for coming to maturity; it says nothing for the quality of the mutton, and gives no consideration to the fact that they require less food than any other breed of sheep, and can therefore be kept in greater numbers. "They pay well for being done well," says Mr. Downing, "and if Herefordshire had been true to itself, and stuck to its own breed of sheep, with the advantages of the modern improved means of feeding them, the county would have been as celebrated now for the flavour of its mutton and the excellence of its wool, as it was 300 years ago. Whereas, instead of this, nearly every farmstead shows a different variety of sheep, and size is aimed at instead of quality."

It appears evident, indeed, that in olden times the fleece was more valuable than the flesh, and the sheep were kept longer alive to grow it. In these days the order of value is reversed, and in our hurry to produce meat quickly, there seems some danger of our losing the true taste and flavour of mutton.

Dr. BULL then proposed the vote of thanks to the Commissioner, which was agreed to by common consent.

A very great interest was now excited amongst the members present by the exhibition of the new fossil from the Woolhope limestone, the *Actinoceras baccatum*. It was discovered in a block of limestone from the Littlehope (or Scutterdine) Quarry, and rescued from the road-mender's hammer by Richard Johnson, Esq., to whom this unique fossil belongs. A monograph upon it appeared in the *Geological Magazine* for last month, by the chief editor, Mr. Woodward, of the British Museum, with a copy of the lithograph made for our transactions. At the request of Mr. Woodward, the Central Committee of the Club gave to it its distinguishing name, "*baccatum*," from the beautiful head-like structure of the siphuncle. The Rev. P. B. Brodie, F.G.S., &c., had since found some small portions of the same fossil at this quarry, and sent a sketch of a larger one which,

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in its general characters, seemed *baccatum*, but the sketch was rather too indistinct to be safely named.

The Rev. Arthur Gray sent a specimen of the Green Helebore *(Helleborus viridis)*, from Orcop, which was not known to grow in that district before; and Mr. Blashill also brought several specimens of the delicate little *Adoxa motchatellina* nicely in blossom, an early spring plant that is not common in the central districts of the county.

The Rev. S. Clark, vice-president, then exhibited a series of what he called "Corrugated Pepples," which he had found in the gravel bed of the chalk of Hampshire. They had the usual yellow-brown coating of that gravel. The "Corrugations" were so regular and complete, especially in some of the specimens, that the opinion seemed general as to their organic formation. Some thought them the production of certain sponges—and in the midst of a resolution to take steps to ascertain their true character—dinner was announced, and a general move took place.

Immediately after dinner, the President had to leave for London on unavoidable business, and the chair was taken by Dr. M'Cullough, the President elect.

The thanks of the meeting were given to Edwin Lees, Esq., F.L.S., Vice-President of the Worcestershire Naturalists' Field Club; to the Rev. William Houghton, of the Severn Valley Club; and to the Rev. J. D. La Touche, of the Caradoc Club, for the honour they had done to the Woolhope Club by coming so far to attend this meeting. Mr. La Touche had been very useful in the services he had so kindly rendered to the club at the Clun meeting last year, and there could be no doubt, with fine weather, that the joint meeting of the Caradoc and Woolhope Clubs on the Clee-hill next July, under his superintendence, would be very enjoyable. Mr. Lees they were always glad to see, for he was too useful not to be missed very much when absent. And Mr. Houghton had been kind enough to bring with him some photographs of a very curious and interesting character, upon which he would favour them with some observations presently.

Dr. M'Cullough then drew the attention of the club to the young Salmonidæ.

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PISCICULTURE IN HEREFORDSHIRE.

By Messrs. LLOYD and SYMONDS.

Mr. Lloyd, of Huntington Court, and Mr. J. F. Symonds, then handed round several glass bowls containing numerous specimens of *Salmonidæ* which they had artificially reared. Mr. Symonds's specimens consisted of Rhine salmon, Wye salmon *(Salmo salar)*, Great Lake trout *(Salmo ferox*, or *Truite grande des Lacs)*, Salmon-trout, *Ombre Chevalier (Salmo umbra)*, a species of greyling, and some common brown or brook trout *(Salmo fario)*. Most of them were four or six weeks old, but some were only just hatched. Mr. Symonds also produced a glass bowl containing about two dozen brook trout of last year's hatching, from eggs obtained at Kentchurch, and very beautifully marked little fish these were. They had been kept through the year in a spring at Broomy-hill. They were very lively and active at first, but a couple of hours' confinement in such close quarters showed they had exhausted the oxygen from the water, and required aërating with an Indian-rubber tube to keep them alive. They were given to the President, and despatched to Harewood the same evening.

Mr. Lloyd also exhibited salmon ova from his trough, 90 days old, which were on the point of being hatched out, the dark specks of the eyes were plainly visible, and in the centre the blood vessels, together with a faint line running nearly round the egg, the body of the future salmon. In another bowl were tiny salmon just hatched out, and only six days old, and it was amusing to see these little fellows dragging about the huge bags attached to their stomachs. It was here remarked, how beautifully nature had provided for the safety and sustenance of these little fish. The large and prominent eyes are the first organs developed, and are perfectly formed and in working order on the instant of the young fish bursting the egg-shell; with the umbilical vessel which provides the nourishment requisite for the first six weeks of the fishes' helpless existence; so that they have little to do but to find their way to the shelter of some large gravel stone, or other projection at the bottom of a stream, to avoid discovery by their scores of devouring enemies of fish, birds, and even insects, all other wants being supplied till the umbilical sac is absorbed in the system of the fish. Then they can freely dart off down the stream, well able to seek their own food and to protect themselves in rapid flight.

Mr. Lloyd also produced several Great Lake Trout in which the umbilical sac was nearly gone. These he mentioned were from ova presented to Dr. Bull by Mr. Frank Buckland, on the 5th of February last. The eyes were then well developed, and they hatched out in about three weeks.

Mr. Lloyd, having been called upon by the President, in the course of his remarks stated that nearly all he knew in artificial pisciculture he had learnt from his friend Mr. Symonds, who had had a long experience. The salmon

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ova now shown were taken from Wye fish on the 27th of December last, and placed in his troughs on the following day; on the 20th of February, an interval of 55 days, the eyes became visible, and on the 20th March (84 days) the first fish were hatched. Mr. Symonds and Mr. W. Stephens, of Wye-bridge, placed the ova taken from the same fish on the same day in their troughs, and while he believes Mr. Symonds' had taken nearly the same time to hatch out as his own. Those of Mr. Stephens hatched out on the 20th of February, in the short period of 55 days. This he accounted for by the difference in the temperature of the water, and the position of the hatching apparatus. Mr. Symonds and his own were sheltered from the action of the sun, and were supplied from pond and river water, which varied from 32 to 42 degrees, as the weather changed. Mr. Stephens's on the other hand were placed in the eye of the sun and fed by a spring which never freezes, and which in the depth of winter has a temperature of 50 degrees, always warm and always equal. From these facts he argued that the instinct of the parent salmon to ascend very far up the tributary stream for breeding purposes was very wisely implanted, because the water there is not only purer but warmer; and though the position is more exposed and dangerous for the parent, it is safer for and ensures the earlier hatching out of their offspring. He was of opinion that it was most desirable in artificial breeding to make use of spring water, and that its temperature should never be less than 40 degrees, and not more than 50 degrees. By this means the early hatching of the ova would be secured, and in a period of 50 to 60 days. Pointing to those diminutive creatures in the bowls, he said they were now barely two grains in weight, and he calculated that it would take those little fellows from twelve to fourteen years to grow *ab ovo usque ad*...the 68½lbs. of the salmon represented in the picture on the mantel-piece. This extraordinary salmon was caught in the river Usk in 1782, and the picture he had brought was a life-size painting of that magnificent fish.

Mr. SYMONDS was then called upon, and expressed the pleasure he always felt in producing his little fish for the inspection of those who took an interest in pisciculture, but the long programme of the president would not admit of much further discussion of this subject; but he mentioned that this year he had been fortunate enough to obtain ova from the establishment of the Emperor of the French, at Huninghue, and hence the variety of the fish now produced; he had been very successful in hatching them out, and he would be delighted to distribute them among any friends who possessed suitable brooks or ponds to put them in. He hoped to keep some of the varieties in his springs for a year, to see how they flourished, and what they were then like, but most of them would be turned out elsewhere almost immediately. It was not an easy matter to provide a large number of such little minute creatures with food sufficiently small. Mr. Symonds drew attention to the little trout in the large glass bowl, all produced from eggs obtained at the same time from the parent fish and hatched out in March and April of last year, yet now so varying in size, that one would think a year at least was the difference of their age,

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but such was not the case. He accounted for it by their being too numerous in his springs, and the larger and stronger fish standing forward in the gentle stream and first catching the small animalculæ floating downwards, in fact getting more food than the others, and he considered the growth of fish, like other animals, depended much on their supply of food, but not altogether so. Probably if the smallest fish could have changed their ground for some nice little brook they would have outgrown the larger sized ones there shown.

His friend, Mr. Key, had brought there a magnificent microscope, which would be the means of showing them how wonderfully and beautifully made these little fish were, and they would be astonished at the marvellous construction of the arteries and the circulation of the blood.

Mr. Key then put under the lens a new-born salmon, and a more wonderful sight could scarcely be submitted to the admiration of students of nature. The tiny heart underneath the very jaws of the little fish was incessantly beating in slow and regular throbs, while the blood was propelled along the arteries, not in convulsive starts like the action of the heart, but in a gentle continuous stream as from a *jet d'eau*, chiefly in one large torrent down the vertebræ, then branching off in all directions through and around the fish. It was said the pulsations were 70 in a minute, but they would probably be slower in a strong fish, not fainting under a bright reflected light, and in a very small allowance of water. It would be difficult to demonstrate so clearly and beautifully the circulation of the blood in animals. The pectoral fins, incessantly moving, were very beautiful objects, and indeed each and every constituent part necessary to build up the frame of this "Monarch of the Flood," was a study in itself to which many of the gentlemen present would have been delighted to devote the entire evening. Where indeed is a work of the Creator which is not a study in itself?

The best object for the microscope was found to be one of the delicate little *Ombre Chevalier*, since they were naturally all but transparent in themselves.

POSTSCRIPT. — Mr. Frank Buckland, H.M.'s Inspector of Fisheries, has most kindly sent to Mr. Lloyd, on behalf of the Wye Board of Conservators, nearly 1,000 young Rhine salmon, for turning out into the river. The fish were despatched in two large-sized paint kettles, by the 9.15 express from Paddington, on Thursday, April 2, and thanks to quick railway transit Mr. Lloyd was enabled to turn them out at 5 p.m. on the same day in the Wye at Glasbury. Only two or three of the little fellows died *en route*, all the rest being quite brisk and lively. When turned out in the shallow streams they instantly sought out hiding places among the gravel. Our Wye salmon are in high repute, but this introduction of Rhine fish cannot be otherwise than beneficial. The salmon of that river run to great weight, and are in season very early in the year. We hope that anglers will spare all salmon fry for the next year or two, and so give this interesting experiment every chance of success.

At the request of the President the following description was then given of

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THE HAIRY FAMILY OF AVA.

By the Rev W. HOUGHTON, M.A., F.L.S.

The photographs, which are before you, represent a mother and two sons now living at or near Ava. The original photographs were brought home a few months ago by my brother, Captain Houghton: they were taken by an artist at Rangoon.

The first notice of this curious hairy family occurs in Mr. Crawfurd's book, "The Journal of an Embassy to the Court of Ava" (vol. i., p. 318, 8vo. edition). "We had heard much," Mr. Crawfurd writes, "of a person said to be covered all over with hair, and who, it was insisted upon, more resembled an ape than a human being—a description however which, I am glad to say, was by no means realised by his appearance." This person's name was Shwe-Maong, and he stated himself to be 30 years of age when Mr. Crawfurd saw him in 1826. This hairy individual was the father of the mother whose portrait is now exhibited.

The Saubwa, or chief of the country where Shwe-Maong was born, presented him to the king as a curiosity when a child five years old, and he had remained at Ava ever since. His height was 5 feet 3½ inches, which is about the ordinary stature of the Burmese. "His form was slender, and constitution rather delicate. The whole forehead, cheeks, eyelids, nose, including a portion of the inside, the chin, in short the whole face, with the exception of the red portion of the lips, were covered with fine hair. On the forehead and cheeks this was about eight inches long, and on the nose and chin about four inches. In colour it was of silvery gray; texture silky, lank and straight. The posterior and anterior surface of the ears, with the inside of the external ear, were completely covered with hair of the same description as that on the face, and about eight inches long: it was this chiefly which contributed to give his whole appearance at first sight an unnatural and almost inhuman aspect. He may be strictly said to have had neither eyelashes, eyebrows, nor beard, or, at least, they were supplanted by the same silky hair which enveloped the whole face. The whole body, with the exception of the hands and feet, was covered with hair of the same texture and colour as that now described, but generally less abundant. It was most plentiful over the spine and shoulders, where it was five inches long; it was most scanty on the forearms, legs, thighs, and abdomen. His features were regular and good for a Burmese; the intellectual faculties were by no means deficient; on the contrary, he was a person of good sense, and his intelligence rather above than below the ordinary Burmese standard."

Shwe-Maong married a Burmese woman with nothing abnormal about her, the king having made him a present of a wife. He had four children by this woman, all girls: the eldest died when three years old, the second when eleven

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months old. There was nothing remarkable about them. The eldest, about 5 years old, had also nothing to distinguish her from an ordinary Burmese. The youngest child was about 2½ years old when Mr. Crawfurd saw her, and was born with hair within the anterior portion of the ear, at six months it began to appear all over the ears, and at one year old on different parts of the body. The hair was of a light flaxen colour and fine silky texture. This child grew up to be the mother of the two hairy beings like herself, whose photographs are before you. Shwe-Maong, the father, had been occasionally employed at the court as a buffoon, having been taught to imitate the antics of a monkey; for these feats however he was not very liberally rewarded; he was a basket-maker by trade.

When Colonel Yule visited Burmah on a mission to the Court of Ava in 1855, he found Shwe-Maong's hairy daughter grown up, and the mother, as I have said, of two children. The mother's name is Maphoon; the whole of her face was more or less covered with hair, on a part of the cheek and between the nose and mouth, this was confined to a short down, but over all the rest of the face was a thick silky hair of a brown colour, paling about the nose and chin four or five inches long. In and upon the ears the hair was most extraordinary, except the extreme upper tip, no part of the ear was visible; all the rest was filled and veiled by a large mass of silky hair, growing apparently out of every part of the external organ, and hanging in a dependent lock to a length of eight or ten inches. The nose was densely covered with hair, with long fine locks like the wisps of a Skye terrier's coat. The beard was pale in colour, very soft and silky.

Maphoon's manners were good and modest, her voice soft and feminine, her neck, bosom and arms were covered with a fine pale down. She had the two boys with her when Colonel Yule saw her. The elder who was then five years old had nothing unusual about him; it will be seen from the photographs of these two children how very abnormal he afterwards became, being now about 18 years old and covered with hair. The younger child, about 14 months old when Col. Yule was at Ava, had its ears full of long silky floss, and could boast a moustache and beard of pale silky down that would have cheered the heart of many a cornet. This child is now about 14 years old, and is represented by the photograph before you.

Both Shwe-Maong and his daughter Maphoon exhibited a peculiarity in their dental apparatus; the former had in the lower jaw only five teeth, viz., the four incisors and the left canine; in the upper jaw there were only four teeth, the two outer ones of which partook of the canine form. The molars were altogether wanting, and had never appeared. The gums were a hard fleshy ridge. Maphoon likewise never had any molar nor canine teeth. It would appear that hair and teeth are in some inexplicable manner correlated; where there is an abnormal character in the hair there is an abnormal character in the teeth. A great living philosopher, Mr. Darwin, has noticed this apparent

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correlated variability. The naked Egyptian dog, for instance, exhibits the feature of abnormal hair and abnormal teeth.

Some years ago, there was exhibited in London a Spanish dancer, Julia Pastrana by name. She was remarkably hairy, having a thick beard and a hairy forehead; in both the upper and lower jaw she had an irregular double set of teeth, one row being placed within the other. Mr. Prestwich, the well-known geologist and antiquarian, told me he had seen this woman. She was photographed, and her stuffed skin exhibited as a show. A photograph of Julia Pastrana was lately exhibited by the Rev. J. G. Wood, at a meeting of the Anthropological Society of London.

Whether Maphoon's two hairy children manifest any dental peculiarities or not, I am unable to say, I will try and ascertain this question, which is one of considerable interest.

The PRESIDENT thanked Mr. Houghton for his description of this very curious and interesting family.

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UPPER SILURIAN FOSSILS.

By the Rev. ROBERT DIXON, M.A.

"Et procul a pelago conchæ jacuere marinæ."
Ovid Metam, xv. 264.

Our head quarters being in the immediate neighbourhood of an upheaval of Upper Silurian rocks, we have thought that we should further one of the objects for which the Club was founded by giving some account of the palæontology of this epoch, accompanied by some fossil sketches, the Central Committee being singularly fortunate in possessing artistic power to illustrate its science.

Deferring the consideration of the fish remains, found as yet in the Ludlow series only, we shall begin with the Mollusca, selecting for delineation not only specimens already discovered at Woolhope, but also typical fossils, which might be found there, from the district of Siluria proper.

Our thanks must be given to those gentlemen who lent the specimens, from which the present illustrations are drawn, bravely disregarding the danger of scientific kleptomania. We would also give notice that any members of the Club, or others, possessing remarkable Upper Silurian Lamellibranchiata, Brachiopoda or Bryozoa, especially if found at Woolhope, are requested to communicate with the Secretary or the Central Committee during the ensuing summer.

SUB-KINGDOM MOLLUSCA.

This great primary division of the animal kingdom is composed of *soft* invertebrate organisms, having a gangliated nervous system, and characterised in general by an entire want of symmetry: in the highest class only do we find anything that corresponds to the internal skeleton of the Vertebrata. Their bodies, however, are often protected by an appendage called a shell, formed by secretion of a combination of earthy and animal matter; and it is to the durability of the former, consisting as it does chiefly of carbonate of lime, that we owe the preservation in the oldest sedimentary rocks of remains of these animals. To the geologist they are especially important, affording, when lithological and other characters are doubtful, the most complete evidence for the identification of strata. In minuter classification, however, the shell is of secondary importance. Conchology having been found, like the Linnæan System of Botany, to bring together species of essentially different characters. Inasmuch, then, as the softness of body prevents the recognition of its form and structure after death, there will always necessarily be great difficulty in correctly ranging the fossil remains of this animal sub-kingdom.

The following is the classification most commonly adopted, formed upon certain peculiarities of the organs of motion, position of gills or other characters,

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which will be specified in the account of each class: if degree of organization be considered to depend upon the restriction of organs to particular functions of life, this classification will be in descending order.

Class I. CEPHALOPODA.
,, II. GASTEROPODA.
,, III. PTEROPODA.
,, IV. LAMELLIBRANCHIATA.
,, V. BRACHIOPODA.
,, VI. TUNICATA.
,, VII. BRYOZOA.

The Tunicata (Heterobranchiata, Blainville), having no hard appendage, are beyond the reach of geological investigation.

There is some doubt about the right of the Bryozoa (Polyzoa, Thompson) to a place in this sub-kingdom. Some naturalists rank them with the Radiates; others, again, regard them as forming with the Tunicata a transitional group, to which they have given the name Molluscoids.

For the convenience of those who may consult "Siluria" with reference to this paper, it may be mentioned that the subdivision of the Mollusca adopted there is as follows:—

Province—ODONTOPHORA.
Class—CEPHALOPODA.
,, PTEROPODA.
,, HETEROPODA.
,, GASTEROPODA.

Province—LAMELLIBRANCHIATA.
Class—CONCHIFERA.

Province—MOLLUSCOIDA.
Class—BRACHIOPODA.
(,, TUNICATA.)
,, POLYZOA.

This classification, which agrees in the main with that of Prof. Huxley (Comparative Anatomy, London, 1864), is one of the best hitherto suggested.

The best manual for the study of the Mollusca is Woodward's Recent and Fossil Shells (London, Weale); we shall follow his arrangement in the subdivision of the several classes, extinct families being indicated in the lists by Italic type, those which have representatives in Silurian rocks by an asterisk.

CLASS CEPHALOPODA.

Order i.—DIBRANCHIATA.

Argonautidæ	*Belemnitidæ*
Octopodidæ	Sepiadæ
Teuthidæ	Spirulidæ

Order ii.—TETRABRANCHIATA.

*Nautilidæ	*Ammonitidæ*
*Orthoceratidæ	

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FOSSIL SKETCHES, No. 1.

CEPHALOPODA.

1. ORTHOCERAS BULLATUM. Sowerby. Half-size, with transverse section. Upper Ludlow; near Fownhope. (Hereford Phil. Society.)

Common in the Upper Ludlow and Downton Sandstone.

2. ORTHOCERAS IBEX. Sowerby. (*Cycloceras.* McCoy.) Natural size, with transverse section. Upper Ludlow; near Fownhope. (Hereford Phil. Society.)

Ranging from the Caradoc beds to the Upper Ludlow.

3. ORTHOCERAS LUDENSE. Sowerby. Half-size, with transverse section. Lower Ludlow; Leintwardine. (Hereford Phil. Society.)

Characteristic of the Lower Ludlow beds.

4. PHRAGMOCERAS PYRIFORME. Sowerby. (*Gomphoceras.* Sil. Syst.) Two-thirds size. Lower Ludlow; Mocktree. (Rev. R. Dixon.)

....(a) Upper chamber of ditto, with the curious contracted mouth. (Dr. Grindrod.)

.....(b) Siphuncle of ditto, from Murchison.

This whole genus is very characteristic of the Lower Ludlow beds.

5. ORTHOCERAS ANNULATUM. Sowerby. (*Cycloceras.* McCoy.) Natural size, with transverse section. Woolhope limestone; Scutterdine, near Hereford. (Rev. R. Dixon.)

Ranging from the Caradoc to the Wenlock series.

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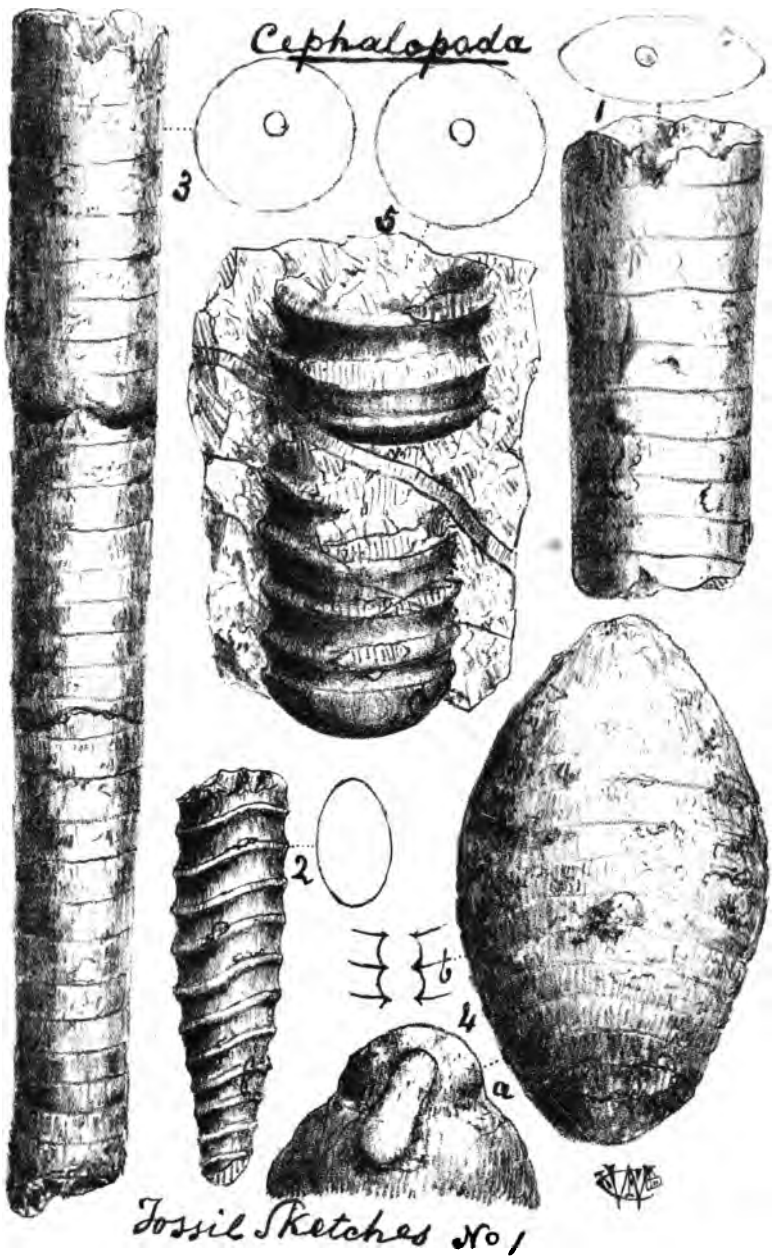

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In this class of Molluscs we find the highest invertebrate organisation; in fact when we consider the distinctness of functions assigned to their different organs, the acuteness of their powers of sight, and, in most of the existing species, of hearing, the size of their cephalic ganglia, which may almost be regarded as a brain, and the possession of a rudimentary internal skeleton protecting these organs, we cannot help assigning them a place in the animal kingdom above the gelatinous fishes. They derive their name from the locomotive and prehensile organs that radiate from the *head*; they are aquatic and breathe by gills (*branchiæ*), concealed beneath a mantle which has two openings, one like a slit for the entrance of water, the other funnel-shaped for its exit; they propel themselves by the forcible expulsion of water from the respiratory chamber.

The class is divided into two orders, according to the number of gills.

No remains of the DIBRANCHIATA or two-gilled Cephalopods have been found before the phragmocones of *Belemnites* in the Lower Lias. Lyell (Principles, p. 152, ed. 1867) calls attention to the fact that several of the existing species are soft-bodied, and that such might have lived in the Palæozoic seas, but have left behind them no memorials of their existence. They progressed in number during the deposition of the Secondary formations, and are now abundantly represented in the poulps, squids, cuttle-fishes, &c., of every sea.

The Silurian Cephalopods belong entirely to the TETRABRANCHIATA or four-gilled order, and to this also are referred the *Ammonitidæ*, which, beginning with the upper Devonian *Goniatites*, characterise afterwards in such profusion the secondary rocks.

McCoy and Sedgwick (Palæozoic Fossils, Camb. 1855), class the *Orthoceras* and allied genera with the *Nautilus* and *Lituites* in one family *Nautilidæ*. Woodward (Recent and Fossil Shells) gives a family *Orthoceratidæ*, keeping with the *Nautilidæ* the genera *Lituites* and *Trochoceras*. Owen (Palæontology, p. 99, ed. 1861), suggests the possible removal of all the palæozoic so-called *Nautilidæ* into the family *Orthoceratidæ*. Whatever division we adopt, we shall get the best idea of an *Orthoceras* by imagining the recent pearly nautilus (*Nautilus pompilius*) unrolled, and of a *Lituites* the same with the apex spiral. Good sections of this mollusc, which should be studied by all who wish to understand the physiology of the Silurian Cephalopoda, are given in Owen's Palæontology and in the frontispiece of Woodward's Recent and Fossil Shells.

The tetrabranchiate Cephalopod has left as its fossil memorial a shell sometimes straight sometimes curved, its transverse section being either circular or elliptical. This shell is divided into chambers, best seen in the Fossil Sketches, Plate ii.; the several chambers being parted from one another by layers of shelly matter called septa. These are generally concave on the face which looks toward the outer chamber, and show themselves on the surface by lines or rings, most simple in the *Nautilidæ* and *Orthoceratidæ*, but in the

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Ammonitidæ sinuous or wavy. It appears probable that the mollusc added periodically to the length of his shell, and formed a new chamber by throwing across a partition behind him. Some *Orthocerata* grew to a surprising length. Woodward mentions an *O. giganteum* from the Carboniferous Limestone which must have been, when living, 6 feet long. Dr. Grindrod has a fragment of *O. Ludense* 3 feet long and 7 inches in diameter. The specimen (3) in Plate i. was evidently only a fragment, the septa being regularly marked throughout, and the outer chamber to which the animal was restricted not appearing.

The next noticeable feature is the "Siphuncle," a membranous tube which passed through every septum, in some species centrically, in others excentrically (in the *Ammonitidæ* along the outer edge), and penetrated to the innermost chamber. No satisfactory account has yet been given of the use of the chambered and siphuncular apparatus. Dr. Buckland, in his Bridgewater Treatise, where a clear and able account of the physiology of the Cephalopoda may be found, held the view of its hydrostatic function, as enabling the animal by means of air to increase or decrease his bulk at pleasure without a proportionate change of weight, and therefore to rise or fall in the water. Modern naturalists, however, doubt the accuracy of this theory, firstly, because the Nautilus appears on the surface only when driven by storms, and secondly, because the fossil specimens exhibit the siphuncle as a continuous calcareous tube, which could not have been distended. This remarkable organ varies considerably in size, from one-tenth to one-half of the diameter of the shell: it presents not unfrequently a series of plates irregularly radiating from a smaller central tube. In some specimens it appears as if composed of a series of variously-shaped beads, connected with the external shell by the septa of the air-chambers. This may be seen in the *Phragmoceras pyriforme*, plate i. (4); but no species yet found exhibits this moniliform or necklace-like structure so remarkably as the unique *Actinoceras baccatum* (plate ii.), fully described in the Appendix; the beads, notwithstanding their age and the enormous pressure to which they have been subjected, retaining a sphericity almost as perfect as those of a new jet necklace. The great durability of this organ is attested by the fact noticed by Owen (Palæontology, p. 101), that in the Silurian limestone cliffs of Drummond Island, silicified siphuncles of *Huronia*, unaccompanied by any vestige of shell, have been seen standing out, like vertebral columns, 6 feet in length, and 1½ inches in diameter.

The generic names of these fossils are not yet fixed determinately, some palæontologists being inclined to split up the genus *Orthoceras* into many sub-genera, while others are satisfied with the old genus. We notice with pleasure that persevering search has shown that the Canadian and Bohemian genera of Dr. Bigsby and M. Barrande have representatives in the British Silurian rocks: the latest discovery is the curious happily-named *Ascoceras* (Siluria, p. 233); it has been found at Usk, Ludlow, and Malvern, and we must look for it at Woolhope.

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FOSSIL SKETCHES, No. 2.

CEPHALOPODA.

ACTINOCERAS BACCATUM. Woodward. Natural size. Woolhope Limestone; Scutterdine. (R. Johnson, Esq.)

A new species of a comparatively rare sub-genus of *Orthoceras*. Its generic position having been determined by the authorities of the British Museum, the Central Committee of the Club assigned its specific name. In an appendix is given a Monograph on this Fossil, by HENRY WOODWARD, ESQ., from the *Geological Magazine* for March, 1868.

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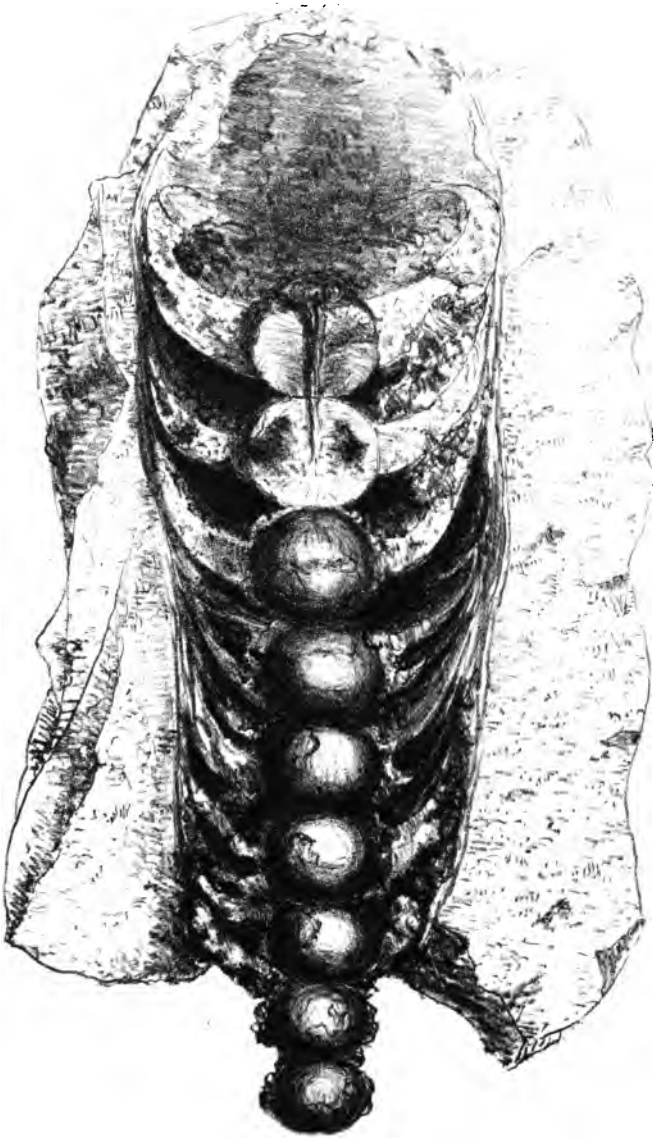

Fossil Sketches No 2

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Sir R. Murchison adduces as a proof of his theory of the non-existence of fishes in the earlier seas, the large number of Cephalopoda in the Silurian as compared with succeeding Palæozoic formations, one set of tyrants at a time being considered by him amply sufficient to prey upon the smaller tenants of the deep. It may be replied, however, that we have abundant evidence in the Carboniferous and Liassic rocks of the coexistence of carnivorous Cephalopoda and fishes. It is difficult to say which biological theories are weaker, those founded on *a priori* considerations or on negative evidence.

In the new edition of "Siluria" there are given 79 British species of Silurian Cephalopoda, of which 8 only have been found certainly in both divisions, 30 appear to be exclusively Lower Silurian, being most abundant in the Caradoc beds, a few are confined to the intermediate Llandovery zone, while the rest have been hitherto discovered only in Upper Silurian rocks.

CLASS GASTEROPODA.

Order i.—PROSOBRANCHIATA.

(Siphonostomata)	(Holostomata)
Strombidæ	*Naticidæ (?)
Muricidæ	Cancellariadæ
Buccinidæ	*Pyramidellidæ
Cassididæ	Solariadæ
Conidæ	Scalariadæ
Volutidæ	Cerithiadæ
Cypræidæ	*Turritellidæ
	Melaniadæ
	Paludinidæ
	Litorinidæ
	*Calyptræidæ
	*Turbinidæ
	*Haliotidæ
	*Ianthinidæ
	Fissurellidæ
	Neritidæ
	*Patellidæ (?)
	Dentaliadæ
	*Chitonidæ (?)

Order ii.—PULMONIFERA.

(Inoperculata)	(Operculata)
Helicidæ	Cyclostomidæ
Limacidæ	Helicinidæ
Limnæidæ	Aciculidæ
Auriculidæ	

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Order iii.— OPISTHOBRANCHIATA.

(Tectibranchiata)	(Nudibranchiata)
Tornatellidæ	Doridæ
Bullidæ	Tritoniadæ
Aplysiadæ	Œolidæ
Pleurobranchidæ	Phyllirhoidæ
Phyllidiadæ	Elysiadæ

Order iv.—NUCLEOBRANCHIATA.

Firolidæ	*Atlantidæ

The common *Helix* or garden snail may be regarded as the type of the second class of Molluscs: they derive their name from the muscular disc on the *belly*, by the successive expansion and contraction of which they are enabled to effect their creeping motion. They inhabit salt or fresh water or the land, and their breathing organs are modified to suit these various spheres of existence; the knowledge of their affinities, therefore, often enables the geologist to determine with tolerable certainty whether a formation or series of beds is marine estuarine, fluviatile, or lacustrine. Their heads are furnished with distinct tentacles and perfectly-formed eyes, with a simple apparatus for hearing. They have a less-developed nervous system than the Cephalopoda, and may be looked upon as presenting the type of molluscous organization, with the least alliance to the Vertebrate or Articulate sub-kingdoms. The shell, with which these animals are usually protected, is univalve and variously-shaped, its typical form, however, being conical and spiral; the aperture is often closed by a lid called an operculum, which the animal brings behind it, when it withdraws into the shell: the variations of this organ are of some use in subordinate classification.

This large class is divided into orders according to the character and position of the breathing organs. In treating of Silurian palæontology, we have to deal with the first and fourth orders only; and we shall therefore dismiss the others with a very brief notice.

The PULMONIFERA (snails, slugs, &c.) inhabit either the land or fresh water; they breathe air by means of a vascular sac at the side of the neck, forming a sort of *lung*; they are generally furnished with a spiral shell sometimes covered with an operculum, sometimes not. The earliest trace of this order was met with in Nova Scotia by Sir C. Lyell, who found a *Pupa* of the family *Helicidæ* in an erect fossil tree of the Coal Measures; the Upper Purbeck beds contain shells of the family *Limnæidæ*; but these Molluscs are of rare occurrence before the Tertiary formations.

In the OPISTHOBRANCHIATA, whose gills covered or bare are situated *behind* the heart, the shell is rudimentary or wanting: one member of the first family *Acteonina* appears in the Carboniferous rocks, but they seem to have flourished most during the deposition of the Secondary and Tertiary formations.

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FOSSIL SKETCHES, No. 3.

GASTEROPODA AND PTEROPODA.

*** *The figures of the Fossils in this sheet are all of the natural size.*

1. LOXONEMA ELEGANS. McCoy. Lower Ludlow; Ledbury. (Dr. Grindrod.)

   Frequent in the Wenlock and Ludlow shales.

2. CYCLONEMA CORALLII. Sowerby. (*Turbo.* Sil. Syst.) Upper Ludlow; Malvern. (Dr. Grindrod.)

   Found, like *Murchisonia corallii*, encased in spheroidal growths of *Favosites fibrosa.*

3. EUNEMA CIRRHOSA. Sowerby. (*Turbo.* Sil. Syst.) Wenlock shale; Malvern. (Dr. Grindrod.)

4. EUOMPHALUS RUGOSUS. Sowerby. Wenlock Limestone; Dormington Wood. (R. Johnson, Esq.)

5. CIRRUS—sp. Woolhope Limestone; Scutterdine. (Rev. R. Dixon.)

   Very common in the Littlehope Quarries.

6. ACROCULIA HALIOTIS. Sowerby. (*Nerita.* Sil. Syst. *Pileopsis.*) Wenlock Limestone; Malvern. (Dr. Grindrod.)

   Found also in Upper Llandovery rocks.

7 BELLEROPHON WENLOCKENSIS. Sowerby. Wenlock Limestone; Dormington Wood. (Rev. R. Dixon.)

   Found also in the underlying shales.

8. CONULARIA SOWERBYI. Defrance. (*C. quadrisulcata.* Sil. Syst.) Wenlock Limestone; The Winnings Quarry, Colwall. (Malvern Museum.)

   This beautiful Pteropod ranges from the Caradoc to the Ludlow rocks.

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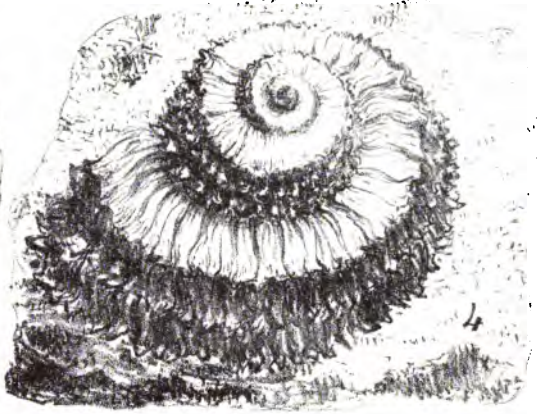
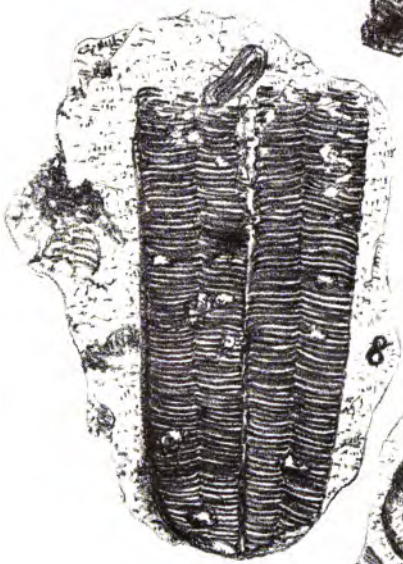
Gasteropoda & Pteropoda





Fossil Sketches No 3

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The PROSOBRANCHIATA, the most highly organised as well as the most numerous of the class, are nearly all marine, and protected by a spiral shell; they derive their name from the position of their gills *in front of* the heart: the *comb-like* structure of these organs originated Cuvier's appellation Pectinibranchiata for a group nearly co-extensive with this order. The aperture of some of their shells is notched or produced into a canal, indicating the passage of a tubular prolongation of the mantle, by means of which as by a *siphon* (hence the name of the section Siphonostomata) water is conveyed to the gills, without necessitating the egress of the animal itself from its shell: Examples of this organization are the well-known whelks, cones, and cowries.

These siphonated Gasteropods are mostly carnivorous; they have not been found in rocks earlier than the Liassic series; their numbers vastly increase in the Tertiary formations, and they still abound on every sea shore.

The normal Silurian Gasteropods belong to the Holostomatous, or *whole-mouthed* section of the Prosobranchiate order. These vegetarian sea-snails have left their petrified shells in all fossiliferous rocks from the Llandeilo flags upwards; only a few, however, of the families are certainly known to have been represented in Silurian seas. Murchison, in the new edition of Siluria, gives 97 species, distributed among 20 genera: of these last the *Turbinidæ* claim the most, although, according to Owen (Palæontology, p. 92), no true *Turbo* is known from strata before the Cretaceous; to this family belong the *Euomphali* (very common at Dormington Wood), of one species of which we give a drawing from a magnificent specimen belonging to R. Johnson, Esq., the *Cyclonemas*, *Eunemas*, and others whose generic names are still unsettled. *Loxonema* belongs to the *Pyramidellidæ*, and *Acroculia* to the *Calyptræidæ*, or bonnet-limpets. A common trochiform genus of the family *Haliotidæ*, having its whorls marked by a peculiar band, usually terminating in a deep slit at the aperture, is called *Pleurotomaria*; and a smaller and slenderer sort, well represented in all but the Wenlock series, has received the name *Murchisonia*, from the veteran Silurian geologist. The *Ianthinidæ* include the Lower Silurian *Holopea* and *Raphistoma*. To the *Turritellidæ* belong the *Holopellas*, bearing some resemblance to the *Loxonema* of our sketch. *Natica*, *Patella*, and *Chiton* are all doubtful.

We have lastly to describe the curious aberrant order NUCLEOBRANCHIATA, so called because the breathing organs form a *nucleus* on the back. Some naturalists have formed of them a separate class, to which they have given the name Heteropoda, from the peculiar *alienation* of the foot from the normal Gasteropodous type. McCoy has differently arranged the Silurian genera usually placed with this order, setting the *Maclureas* with the Prosobranchiate family *Trochidæ (Turbinidæ)*, and raising the *Bellerophons* to the class Cephalopoda; we have, however, followed Owen, Woodward, and Carpenter in placing them with this order at the end of the Gasteropoda, not because of any inferiority of organisation, but to mark their divergence from the type of the

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class. Their habitat is the sea, on whose surface they swim with the back downwards. The *Firolidæ* have large bodies, either altogether unprotected, or with a small glassy shell attached; they live in warm seas. The *Atlantidæ* have large shells, into which they can withdraw themselves at pleasure, and close them with an operculum. *Maclurea* is a Lower Silurian genus, of which Murchison gives four species. *Bellerophon* has eighteen species dispersed among all the Silurian formations: the species figured is not uncommon at Dormington Wood. *Bellerophon dilatatus* is a giant species; *Bellerophon trilobatus* a dwarf of the genus.

Fuller particulars about the Gasteropoda, and the strata, of which the several species are characteristic, with many figures, may be found in the new edition of Siluria.

CLASS PTEROPODA.

(Thecosomata.)	(Gymnosomata.)
*Hyaleidæ.	Cliidæ.
Limacinidæ.	

This small class, the lowest of univalve encephalous molluscs, represents in this sub-kingdom, the Birds of the Vertebrata and the Insects of the Articulata: they propel themselves through the water, to which sphere of existence they are altogether limited, by means of a fin-like expansion on each side of the head and neck, furnished with muscular fibres, and they derive their name from the resemblance to *wings* of these organs of motion. Their internal structure is very complex, presenting many points of resemblance both to the Cephalopoda and Gasteropoda, and yet of a type distinct enough to entitle them to the rank of a separate class. They possess in most cases minute eyes, projecting prehensile tentacles, and lingual teeth, adapting them, frail as they are, to prey upon the still frailer crustacea of the ocean. They form two sections, one consisting of the families whose members have a *case* for their *bodies* (Thecosomata), the other of the *bare-bodied* families (Gymnosomata); the latter section would not be likely to leave behind it in sub-marine deposits any traces of its existence; myriads of its best known genus *Clio* are seen swimming in the high latitudes, where they provide the whales with their chief means of subsistence. Shells of the family *Hyaleidæ*, distinguished by their glassy delicacy, are found in the miocene beds of Italy; but about the occurrence of Pteropodous shells in the older rocks there is much uncertainty. The only palæozoic genera placed by Woodward in this class are *Theca*, *Pterotheca* and *Conularia*, the two former being exclusively Silurian, and the latter ranging thence to the Carboniferous formation: Murchison with some doubt adds *Ecculiomphalus*: Owen is inclined to connect with these the genus *Euomphalus* and the Lower Silurian *Maclurea*, of which we have already spoken in the Gasteropoda. The new edition of Siluria gives twenty-seven species in this class, fourteen belonging to the genus *Theca*, which has, however, only two representatives in

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APPENDIX.

[*Extracted from the* GEOLOGICAL MAGAZINE. Vol. V. No. 3. March, 1868].

ON *ACTINOCERAS BACCATUM*, A NEW SPECIES OF ORTHOCERATITE FROM THE WOOLHOPE LIMESTONE.

By HENRY WOODWARD, F.G.S., F.Z.S.

[PLATE VIII.]

THE fossil about to be described was obligingly sent to me by Dr. Bull, of Hereford, having been happily rescued from the remorseless hammer of the road-mender, by Richard Johnson, Esq., the Town Clerk of that city. It exhibits the shell in section, fractured longitudinally, and embedded in a hard compact mass of dark blue Woolhope Limestone, which may be seen well exposed *in situ* in the Little Hope quarries, near Woolhope, from whence the block which contains the fossil was derived. Dr. Bull informs me that the Woolhope Limestone from these quarries is always used for road-metal in the surrounding district.

It is most faithfully delineated (of the natural size) in the accompanying lithograph (Plate VIII.), by the able pencil of Dr. Bull.

The fossil has been fractured so as to remove the upper surface, exposing seven perfect and two fractured beads of the siphuncle, and giving evidence of ten septa; the chambers formed by which remain partially hollow and are partly filled by calcareous spar. None of the exterior wall is visible from which the nature of the ornamentation of the shell, if any, might have been ascertained, but the interior portion is so characteristic of the genus that I have no hesitation in referring it to *Actinoceras*.

That genus is characterized as follows:—"Siphuncle very large, inflated between the chambers, and connected with a slender central tube by radiating plates."[1]

Of the species referred to this genus five are British, namely,

Actinoceras	*Brongniartii*, Portl.	Lr. Silurian,	Tyrone.
„	*Brightii*, Sowerby,	U. „	Malverns.
„	*nummularium*, Sowerby,	„	Tortworth.
„	*giganteum*, Sowerby,	Carb. L.	Yorkshire, etc.
„	*pyramidatum*, M'Coy,	„	Ireland.

The Woolhope fossil most closely resembles *A. pyramidatum*, of M'Coy, both in the beaded form of the siphuncle and the general proportions of the chambers, but the beads of the siphuncle are much less spherical in *A. pyramidatum*, and the sides of the chambers form a less acute angle at their junction with the outer wall of the shell than in the fossil before us.[2]

[1] See "Woodward's Manual of the Mollusca," p. 58.

[2] Compare figure on Plate VIII. with M'Coy's figure in Carbonif. Foss. of Ireland, table *l*, fig. 5; see also Barrande's "Syst. Silur. de Bohême (Cephalopoda)" vol. ii., pl. 232, fig. 11.

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The following are the proportions of the Woolhope specimen :—

Extreme length of siphuncle composed of 9 beads, 4¼ inches: transverse diameter of largest bead of same, 9 lines; vertical thickness of same, 7 lines; transverse diameter of smallest bead, 6 lines; vertical thickness of same, 4 lines; greatest diameter of shell, 2 inches; least diameter of shell, 1 inch 4 lines; interspace between one septum and another in largest chamber, 6 lines; in smallest, 3 lines.

Neither the apex or body-chamber of the shell being present, we can only surmise its length. A section of *Actinoceras giganteum (?)* from Derbyshire, preserved in the British Museum, measures 2 feet in greatest length and 3⅞ inches in greatest breadth, and exhibits thirty-eight body-chambers. An *Orthoceras* from Ireland, in same collection, measures 2ft. 10½ inches in length and 16in. in circumference. Many have been discovered even far larger than these.

To this group, undoubtedly, belong the most gigantic forms of the straight *Nautilidæ*.

The interest attaching to this most ancient group of chambered shells is such, that I have gladly availed myself of Dr. Bull's kind proposal to notice it in the pages of this Journal, accompanying the notice with his excellent figure. I have not only carefully examined the specimen myself, but have been favoured with the opinion of Professor Morris thereon, and I am confirmed in the conclusion that the Woolhope specimen is specifically distinct from any other heretofore described. I have therefore (at the suggestion of Dr. Bull) named it *Actinoceras baccatum* (in reference to the beautiful bead-like structure of the siphuncle).

The characteristic fossils obtained from the Little Hope quarries in the Woolhope Limestone from whence *A. baccatum* was derived are: Trilobites—*Illœnus Barriensis, Homalonotus delphinocephalus,* and *Phacops caudatus.* Mollusks—*Orthoceras annulatum, Strophomena depressa, S. euglypha, S. pecten, Rhynchonella Wilsoni,* and *R. Stricklandi, Cirrus* — sp.; and also *Cornulites serpularius* and *Ptychophyllum patellatum.*

The Little Hope or Scutterdine quarries (which are quite *beneath* the Wenlock shale) are intersected by the Geological Survey, section No. 2 on sheet 13, and their precise position is laid down on the Ordnance Map No. XLIII., N.W.

It is to be hoped that the Woolhope Naturalists' Field-club, which numbers some excellent geologists among its members, will detect further specimens of this interesting fossil, and that we may be able, at a future day, to add a more full description to the present very brief notice.

STEPHEN AUSTIN, PRINTER, HERTFORD.

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the Upper Silurian rocks; we have given a drawing of the species of *Conularia* which seems to have had the longest range, and for the loan of the original we have to thank the curators of the Malvern Museum. If these shells were really the appendages of Palæozoic Pteropoda, they must have been gigantic compared with the living species.

The PRESIDENT then called upon Mr. Key for his paper, entitled—

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CONCLUDING REMARKS ON THE BRITISH OAKS.

By the Rev. H. COOPER KEY, M.A., Vice-president.

After our anniversary dinner last year a good many objections were raised against my estimate of the comparative values of our two principal British oaks, the *Sessiliflora* and *Pedunculata*. These objections were so various and ran to such a length that I was quite unable to reply to them at the time, but shortly afterwards I drew up a paper in which I gave a detailed answer to each. This paper I had intended to read on the present occasion, but I abstained from doing so for two reasons;—first because our time this evening is limited, and secondly because it has come to my knowledge that the whole question in dispute has been already before a competent tribunal, and has been, I may say, authoritively settled once before all, as I will presently show.

First of all, however, I wish to make a few observations on one or two objections which were raised this time last year.

Mr. Blashill, from one of his remarks, seemed to think that we have but two indigenous forest oaks, the *Pedunculata* and *Sessiliflora*. He spoke of the "Durmast *or* Sessiliflora," saying "you must not mention the New Forest—the home of the Durmast or *Sessiliflora* oak—to a purchaser of ship timber." Now the fact is, the Durmast is a quite different kind of oak, it is not the *Sessiliflora*, it is a third variety, and goes by several names in different parts of England, such as *Quercus atrovirens, intermedia, pubescens* or bastard oak. Indeed it is evident that this fact, of there being a third and worthless variety bearing some resemblance to the *Sessiliflora* in the leaf and fruit, though not in the habit,—having been overlooked, has caused a good deal of confusion, and very much damaged the character of that valuable species the true *Sessiliflora*.

Again, there is one more point I had stated, that the *Pedunculata* timber was weakened by the existence of the principal medullary rays, well known as the flower in the grain of the wood, and that where the flower was prominent, when split or broken it invariably fractured at the spot. Mr. Blashill denied this statement altogether, and said that "the French call this cross-grain or flower the *maille*, i.e., the stitch, from the idea that it holds and gives solidity to the other grain." Now, the fact is, that the word *maille*, thus applied, does not mean stitch at all, it simply means the *spot* or *mark* in the grain. The word is derived from the Latin *macula*, a spot. It came thence to mean the interstices between woven fabrics of any material, and was specially applied to chain armour, hence our "coat of mail." And when we speak of a meadow *émaillé de fleurs*, we mean spotted over, or enamelled with flowers, the word enamelled being from the same origin.

There is one other point I wish to mention. Mr. Wells found that his seedlings of *Q. Pedunculata* rather outstripped those of *Q. Sessiliflora* and

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considered this a reason for believing the former to be the fastest growing tree of the two, while he acknowledged at the same time that the roots of the *Sessiliflora* were the stronger and the whole plant sturdier. But to draw conclusions as to the rapidity of growth and formation of timber in the grown tree from its habit while a seedling is, I cannot help thinking, very likely to mislead. For instance, no forest tree, while young, is more rapid in growth than the ash, which throws up shoots eight and ten feet long in one season, while as a grown tree, scarcely any is slower in the formation of timber.

I will conclude with the mention of a circumstance which I was not aware of at the time I wrote my paper, viz., that in the year 1853 this very subject engaged the attention of no less a body than the Horticultural Society of London. The questions they desired to have settled were these: (1) Of what wood was the roof of Westminster Hall really built? and (2) Which was the most desirable species of oak to plant for timber? They accordingly appointed certain persons, believed by every one to be the fittest for the purpose, to examine these questions minutely and to report. Among these names we find those of Mr. Atkinson, the eminent architect, and a great authority on timber for building purposes; Mr. Tredgold, the renowned engineer, an unrivalled authority on timber; Donald Beaton, the great gardener, a man often consulted by Mr. Darwin and mentioned by him with the greatest respect in his last work, "The Variations of Animals and Plants under Domestication"; Dr. Lindley, the eminent botanist, and others. The result of this enquiry was that the roof of Westminster Hall was proved to be indisputably of *sessiliflora* oak, and the final impression of the society, after hearing all the evidence as to strength of timber, durability, quickness of growth, &c., &c., was that the *sessiliflora* oak was the tree which ought in future to be planted in all the Royal Forests.

Mr. EDWIN LEES rose at the call of the President, and said that Mr. Key had not noticed a remark he had made last year when the subject was so fully debated. Much had been said as to the relative qualities of the timber of *Quercus pedunculata* and *Q. sessiliflora*, but nothing as to that of a variety interposed between them that bore the name of *Q. intermedia*. He was satisfied that, botanically speaking, there was but one species of oak in this country, and varieties had arisen from it. Acorns from *Q. pedunculata* might produce *Q. sessiliflora* or *intermedia*, or even other varieties, and all the acorns of *sessiliflora* would not produce the precise tree from which it sprang. If acorns were sown in a soil adapted to the growth of the oak, then it little mattered whether *Q. pedunculata* or *sessiliflora* was selected, the timber would be good and sound. Geologists had named a stratum of the Oolite in Oxfordshire, the "Oak-tree clay," from its speciality in producing magnificent oaks of sound timber, and this was truly the old oak of the country, the *robur* of Linnæus, for the botanists and foresters of former times made no distinction. Only find out the soil and aspect suited to the growth of the oak, and whatever varieties might be produced

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was really a matter of minor consequence, for timber might be good or bad of any variety if a favourable soil and aspect in which the oak could take its growth properly was not selected. The original oak of England was *Q. pedunculata*, and now, as formerly, the great majority of oaks consisted of it.

The Rev. H. C. KEY said that Mr. Wells of Holme Lacey had grown the two kinds separately for some years, and found them quite distinct; but the young plants of *pedunculata* were more robust and grew faster than those of *sessiliflora*.

The Rev. GEORGE CORNEWALL said he should like to ask Mr. Lees one question, viz., his opinion as to whether poor soil would produce poor timber, and good soil good timber?

Mr. LEES: If the soil were adapted to the growth of oak, I should say that good soil would produce the best timber.

The Rev. G. CORNEWALL: But in the same soil you will find the two varieties growing side by side, *Sessiliflora* will grow faster and make a finer tree than *Pedunculata*—at least it is so at Moccas and Tibberton. Is it not a fact within our experience that, as to growing oak timber, that the poorer the soil the better the timber is?

Mr. LEES thought not.

Mr. H. SALWAY (vice-president) would not presume to give an opinion in a scientific point of view, but he had had some practical experience in the growth of timber. He thought that it was not the richness or the poorness of the soil which had anything to do with the quality of oak or the size of it; and although on the borders of the Silurian district some good oak was grown, it seemed to him that the soil which was most impregnated with iron would grow the best oak. He considered gravels and alluvial deposits unfavourable to oak. When the soil was suitable it need not be deep, for he had known oaks of very large dimensions growing in soil not more than a foot deep, sending their mighty roots into the fissures of the rocks in a manner that had caused his astonishment and admiration. Aspect, too, had something to do with it: and from his experience he should say that a cold, northerly aspect would grow better oak than a warm, southerly one. As to the different kinds of oak, he really should not like to express any positive opinion, but he could say from experience that they varied considerably. Some 30 years ago he collected some acorns from one of the finest trees in Oakley Park, a very large and beautifully grown tree, with an idea that the seedlings would follow the parent tree. The result, however, had much disappointed him, for, although he carefully gathered and kept the acorns unmixed with those from any other tree, each seedling presented some peculiar character. They were fine, healthy seedlings. Some grew short and some grew high, and they presented considerable variation in their leaves and bark. They all grew tolerably well, and were planted in different directions round Ludlow. Some went to Ashley Moor, some to the Clee Hill, some to Richard's Castle,

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and some to Orleton and other places. He had often seen these trees since, and he found that their after growth had depended on the character of the soil in which they were placed. The more iron it contained the better they grew. As to the character of the trees themselves, some were original, and some produced the common leaf; some made heads as if they were pollards, and some went up in a straight line, making longer trunks. And in his experience he had always found that upon examining closely the leaves of a bed of seedling oaks, from the same tree's acorns, you could always find more or less variation in the leaf of every tree. Thus he held that every tree grown from an acorn was an original tree, and that it was impossible to tell, by gathering the seed, what the tree would be. Everything that came from seed must have an originality in it. Seedlings are never exact repetitions of the parent tree, like a row of poplars grown from the cuttings of a tree, or like apple trees grafted from the same parent stem. If they took two pips from the same apple, they would not get two trees of the same kind: the one would differ from the other, and neither show the exact character of the parent tree. And so, in his opinion, oak trees had the same originality; and if he was to be guided by his own experience he should say, very decidedly, that there was but one genus of British oak, but several varieties.

Mr. BLASHILL (vice-president) agreed with the previous speakers that the most important differences in the useful qualities of oak timber were due to soil and situation. Still the differences now under discussion had a different origin—whatever that might be—producing several varieties, of which *pedunculata* and *sessiliflora* were the extremes. As to their comparative value we must not be afraid of inquiring into it, for even final settlements of such matters sometimes needed to be reviewed. He was sure, therefore, that Mr. Key would not object to have those matters upon which they differed still further looked into; for with due deference to the distinguished botanists and others whose opinions had been quoted, he was convinced, upon looking at the question from all points of view, that there never had been the exclusive or even preponderating usage of *Q. Sessiliflora*, which had been claimed for it. The characteristics of oak as found in old buildings and as now grown were identical, presenting quite as much of the "flower" then as now; but as this matter could readily be placed beyond doubt by a reference to the nearest old church, he would only add this expression of opinion to the specimens he had already exhibited. He had on a former occasion given as exact a description as he could of the mode in which the line of cleavage passed along the timber in making park palings, and also in natural cracks, supported in each case by specimens, according to which the split certainly did not seem to take place by reason of the medullary ray. A specimen now in the room showed that the ray was much less liable to decay than the ordinary fibre, and it was also remarkable that in handrails that had been subjected to very heavy wear the ray had resisted it almost entirely, and stood up in ridges on the surface. There was really no need to fear that good timber, of either variety, would decay unduly if kept fairly exposed. Dr. Bull had

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exhibited some specimens of the wood of *Q. Sessiliflora*, from Holm Lacy, which, though carefully authenticated, seemed to have all the amount of flower usually found in *pedunculata*. The truth was that this question needed the careful examination of many examples before it could be decided, and he regretted that Mr. Key had not favoured the club with his own observations, which would have been much more valued than the opinions of the authorities that had been quoted, for though Tredgold, for example, was a painstaking and useful inquirer, he was not of such eminence as to guarantee his conclusions from being afterwards upset.

With respect to the derivation of the technical term "*maille*," the important point is its present meaning, rather than its derivation. The French do not seem to use the word in the sense of "spot," they apply it to the medullary ray, as it lies in the wood. Thus, timber sawn in the direction of the ray, or, as we should say, "on the quarter," they say is cut *sur maille*; and the word seems to bear as nearly as possible its common meaning of a stitch or network uniting the ordinary fibres. (See Viollet le Duc's Dictionary, article *Menuiserie*): "Le chêne est formé d'une succession de couches comme tous les bois, mais ces couches sont réunies par des espèces de chevilles naturelles qui les rendent solidaires: ces chevilles qu 'on nomme *mailles*, tendent au centre du tronc."

In reply to a question, Mr, Blashill said that he believed it was the fact that the poorer the soil the oak grew in, the better was the timber, which probably meant that a very slow growth ensured hardness and toughness of fibre.

The next paper read was

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ILLUSTRATIONS OF THE EDIBLE FUNGUSES OF HEREFORDSHIRE.

(By Dr. BULL.)

"Nothing we see but means our good,
As our delight, or as our treasure:
The whole is either our cupboard of food
Or cabinet of pleasure."
George Herbert.

In those countries where Funguses are well known and properly appreciated they have been termed "The Manna of the Poor." The growth, as it were, of a single night, they are gathered, morning after morning, for the simple trouble of collection, and form, with dry bread, the sole food of the inhabitants for many weeks, or even months together. In their many kinds they make a varied diet which is looked forward to with pleasure by the rich as well as by the poor over extensive tracts of Norway, Sweden, Russia, Austria, Hungary, great part of Germany, the south of France, and Italy. Wherever much land remains uncultivated, they are very abundant, and there the season of Funguses with the poor is a season of plenty as well as of pleasure, and experience has long since proved that it leaves those who thus live on them in the full enjoyment of health and strength.*

In another sense, too, Funguses, in these countries, are the "Manna of the Poor." What they do not themselves consume, they sell. When fresh or dried, or variously preserved in oil, or vinegar, or brine, they meet a ready sale, and thus many, who have no other produce to bring into the market, obtain a valuable source of income.† Their use on the continent is almost universal. They flavour the dishes of every table, and to them is undoubtedly owing some of the renown which justly belongs to foreign cookery.

It is very remarkable, that an article of diet so commonly used throughout Europe should be so much neglected in England, and it gives rise to the natural question, "Is it to be found here with the same valuable properties, and in sufficient abundance and variety to make it worthy of notice?" In every particular the answer to this question must be given affirmatively. The same valuable Funguses, for the most part, grow with equal luxuriance in the foggy land of

* On seeing the peasants about Nuremburg eating *raw* mushrooms, Schwœgrichen resolved to try them, and he, too, for several weeks, restricted himself entirely to this diet, "eating with them nothing but bread, and drinking nothing but water, when, instead of finding his health impaired, he rather experienced an increase of strength." Dr. Willdenow made the same experiment, and with precisely the same result.

† Dr. Badham computes that the value of the Funguses sold in the city of Rome in a single year amounts to nearly £4000; and since the population of Rome is only 154,000, whilst that of Naples is 360,000, and that of Venice 180,000. And he asks, "If this is the value of Funguses sold in a single city, what must be the net receipts from the market places of all the Italian States?"

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Old England as on the Continent, and the experience of all those who have paid any attention to them—who have studied and eaten them—proves beyond doubt that they retain their good qualities. The Parasol Agaric of Europe is equally good here, and our Fairy-ring Champignon, with all its excellent qualities, is theirs. "No country is perhaps richer in Esculent Funguses than our own," says Dr. Badham. "We have upwards of thirty species abounding in our woods. No markets could be better supplied than the English, and yet England is the only country in Europe where this important and savoury food is, from ignorance and prejudice, left to perish ungathered."

The "Manna" is plentiful, but our poor don't recognise it.

Every kind of fungus, like every species of plant, has its own peculiar properties: one is wholesome, and another is poisonous, but the very great majority of both plants and funguses are neither the one nor the other, they have their uses in other ways, which it is not now necessary to point out. Poisonous plants are much more numerous than poisonous funguses, and equally virulent, but they are much better known, and therefore but few accidents happen with them. It is true that we hear most years of a whole family or two being poisoned from eating scraped Aconite root instead of Horse-radish; but this need not be. It is the result of pure carelessness. As well might the venemous Fool's-parsley, which grows in every garden, be eaten for the true Parsley; or those poisonous plants, the Water Hemlock or the Water Dropwort, be gathered and eaten for Watercress. Knowledge and the habit of discrimination has rendered such accidents happily very rare. So, too, some of the poisonous Funguses are very common, and year by year we hear of families poisoned from eating them, gathered hap-hazard as they must be, for ignorance with regard to Funguses is almost universal. A very great prejudice has thus been created against the whole tribe—the common mushroom excepted,—and this prejudice is raised to the highest degree by the ever-present consciousness of the want of information to distinguish between the good and the bad.

The same knowledge with regard to Funguses as exists with regard to plants, would render such accidents equally rare and without excuse. Funguses do not change their characters. The edible kinds of fungus are edible everywhere. When in a proper condition they "never become poisonous, nor conversely the poisonous varieties fit to eat" (Badham). The edible fungus, nevertheless, may become unwholesome from age, decay, or decomposition, perhaps also from being gathered in some unhealthy situation, but these are exceptions that can readily be guarded against. The same kinds will of course differ greatly in flavour, according to the locality in which they may be gathered. It is the same with other kinds of food. Wild animals, mountain mutton, country chickens, as well as field mushrooms, are all preferable to those produced under more artificial means. This is simply a matter of flavour, and not from any real change of property or quality. Neither plant nor fungus changes its nature, each species has distinctive

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characteristics peculiar to itself, and by which under all circumstances it may be recognised with ordinary observation.

The common field mushroom, *Agaricus campestris*, is readily known by everyone, and the great majority of the other edible species only require to be known, and may then be gathered with equal security. This one single member of the agaric tribe is the only one that has been received into favour, but it is so very generally appreciated for its richness and flavour that one might have thought that it would have ensured a fair trial for some of the other species. But no, it is the only kind known, some of the others are poisonous, nothing is known about any of them, and therefore they are all condemned. The common mushroom itself, when in an improper condition will occasionally prove poisonous. And there are certain people who, from some individual peculiarity, cannot taste a mushroom without suffering from it. With these exceptions, the mushroom, as every one knows, is a rich, wholesome food; and many other Funguses also deserve the same character if they were equally well known.

It seems peculiarly the province of a Naturalists' Field Club to endeavour to combat this prejudice by imparting the knowledge which will rise superior to it, and to show clearly and plainly that there are other Funguses as common as the ordinary mushroom, and as wholesome, and some moreover which will be thought equally delicious; each one with its own individual flavour, varying in delicacy, in richness, and in power.

Throughout the whole tribe there is the unmistakeable fungus flavour, just as with fish in all their varieties, the fishy taste prevails. To compare the taste of every other kind of agaric with that of the common mushroom, as is so constantly done, is much the same as to compare every other kind of fish with the salmon. Granted, if you please, that the field mushroom with people in general is, and ever will be, the king of Funguses, as the Salmon is thought the king of the fish, but as there are, and ever will be, those who prefer to Salmon, the Turbot, the Sole, the Cod fish, or the Eel, so there will be those who when once they have learnt to distinguish and appreciate them will take in preference to the mushroom, the Parasol Agaric, the Orange Milk Agaric, the Fairy-ring Champignon, the Morelle, the Chanterelle, the Puff ball, or some of the many other kinds of Edible Funguses.

The fact of some of the poisonous kinds being very common only renders it the more necessary that the means of discriminating them should be plainly set forth. In scientific books this has long since been done, but such descriptions are only available to those accustomed to botanical characters. It is not safe to trust to unaided observations to distinguish the edible from the poisonous species. An attractive colour and appearance, an agreeable smell, and a pleasant taste are very favourable signs of an Edible Fungus; just as indications the very reverse of these would create an unfavourable impression — and as a general rule the conclusion in either case would be right, but neither the one nor the other is to be strictly relied upon. It is necessary, therefore, in addition

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to a written description of the fungus itself, and a judicious use of the natural senses with regard to it, that carefully coloured drawings should be given of its ordinary appearances. To do all this is the object of these Illustrations, and since only those species of Edible Funguses which possess clear marks of distinction will be brought forward, all chance of error will be removed from those who will exercise ordinary observation and care.

In considering the utilization of Funguses for people in general, it must be borne in mind that they could never be depended on in England as a chief article of diet. The country is too thickly populated, the waste or pasture land on which Funguses mostly grow is limited, and, moreover, they only spring up to any extent in the autumnal season. It must also be remembered that their production is of a very fickle nature, great quantities appearing in some seasons, and very few in others—dependent, in fact, on meteorological relations of moisture and temperature. Nevertheless if it was possible to overcome the popular prejudice in respect to them, they are generally sufficiently abundant during the autumn months to increase the food of the working classes, to vary it, and to add a great relish to the usual dishes of the humblest cottager. When large families have to be fed, and provisions are dear, it becomes a matter of paramount importance to add, if possible, to the economic supply of food. In the case of the Edible Funguses, prejudice and ignorance alone interfere with their extended use, and thus supplies of wholesome food, placed by Nature within the reach of all, are suffered to perish, despised and neglected.

It is within the power of the members of Naturalists' Clubs to do something to remedy this. The poor are apt to judge of the worth of anything simply by its *money value*. They will bring anything to market which they can sell—Cowslips, Watercresses, Turnip-tops, certain "Yarbs," as they call them, and now, even Ferns are coming in. They have been taught from childhood to despise "Frogstools," and they know well enough that if they tried to sell a basket of Puff-balls they would be laughed at. Let gentlemen learn themselves what Funguses are edible, teach their poorer neighbours to know them, and then *buy the baskets they collect*, and they would soon be forthcoming at market. The peasantry would then learn practically that the objects of their aversion had a money value—and were bought as palatable and wholesome. In a short time they would copy the taste of their superiors. Example is always more telling than precept. They would be led to use what they previously despised, abandon prejudice, and accept the bounty of nature.

There are certain general rules which should always be observed with reference to Edible Funguses, and they are these :—

1.—Every species should be gathered young and sound.

2.—They should always be cooked when quite fresh with butter or oil, and be well done.

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3.—Bread should be taken freely with them.

And, lastly (4), they should be taken in moderation, since all are more or less rich, and the discomfort of a fit of simple indigestion, has often before now, given rise to a suspicion of poison.

And so too, with regard to cooking Funguses some general rules may be satisfactorily laid down. The singular resemblance which Funguses bear to meat, in their taste, and even in their properties, gives the clue to their proper mode of cookery. A broil, a fry, or a stew, are generally available with or without a little good beef gravy, or even prepared stuffing, and for condiments, besides the salt and pepper always requisite, onions, or even garlic, with a little spice, or lemon juice, according to taste, and almost any kind of wine you may chose to add. In all instances they should be well cooked for safety, but not overcooked so as to lose flavour, and cooked however they may be, they should be served hot, on a hot dish, and with warm plates.

Herefordshire is not behind other counties in the abundant crop of Funguses it produces. In our rich meadows and varied uplands, and in our numerous woods they grow in great profusion and luxuriance. Few of us are aware of their great variety, the beauty of their colouring, or the gracefulness of their forms. They grow, for the most part, at a season when vegetation is on the decline, and they clothe the country with a suddenly renewed beauty. When the field labours of the ordinary botanist appear to be at an end, his work, who would study Funguses, may be said to begin. The same wide extent of country affords his hunting grounds, and an equal pleasure awaits him. The foggy autumnal morning will by no means repress his energy, for the "night-springing mushrooms" are revealed through the mist, and whether the mystic fairy-ring be invaded, or the depth of solitary woods be explored, many a gloomy cheerless day that might otherwise have passed listlessly along, will be filled up with excited interest and delight.

Elegant and beautiful as many Funguses certainly are, they can be shown to have a value to a certain extent unappreciated. To our Club, as the humble representative of Natural Science in this district, belongs the duty of showing their usefulness, and of calling attention to an article of diet at once savoury, nutritious, and wholesome, and which may, moreover, be gathered free from all cost. The "Manna" is here in abundance, let us be thankful, take courage, and gather it.

It is not within the province of this paper to enter into the general systematic arrangement of the tribe of Funguses further than is absolutely required for the more perfect distinction of the several species brought forward. Science will step in with the individual Fungus. A minute description of each one will be given, and its distinctive characters will be prominently pointed out.

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A drawing of each species from nature, carefully coloured, will be added, and thus with common care it will scarcely be possible that any mistake can be made in recognising them. Opinions of those who have eaten them will be given, as to their edible merits; and receipts for cooking them added, keeping as far as may be economy and simplicity in view.

The three Funguses selected for Illustration in the present paper are the *Agaricus procerus*, *Lactarius deliciosus*, and *Marasmius oreades*. They are three of the most valuable Agarics, all very common, all most useful and savoury, and yet all thus far almost completely wasted and lost. In future years it is proposed to continue these Illustrations if the members of the club should desire it.

EXPLANATION OF THE TERMS USED IN THIS PAPER.

The tribe of Funguses is divided into families according to the situation of the *hymenium*, or fruit bearing part of the plant; and the Mushrooms, or Agarics *(Agaricini)* so well known by the vulgar as "Toadstools" or "Frog-stools," form a large order, divided into different series by the colour of their spores.

The *Mycelium* is the underground plant from which the fungus springs. It consists of numerous delicate, colourless fibres which permeate the soil and interlace in all directions.

The *Spores* are the reproductive bodies found on the *hymenium*, and compose the dust which falls from the gills of an agaric.

The *Pileus* or cap, is the whole top of the fungus supported on the stem, and is divided into the cuticle on its surface, the flesh within, and the gills beneath.

The *Veil* is the membrane that covers the whole fungus in its first stage of growth; it forms the cuticle on the pileus, covers the gills in their young state, and often remains as a ring on the stem.

The *Gills*, or *lamellæ*, are folds which form the *hymenium* in an agaric and bear the spores.

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Agaricus procerus. The Parasol Agaric

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DIVISION I.—AGARICUS.

SERIES I.—LEUCOSPORI (Spores white).

SUB-GENUS 2. LEPIOTA.—*Fries.* (λεπίς a scale.)

Veil universal, concrete with the cuticle of the pileus. Hymenophorum distinct from the stem. Cuticle dry. Ring moveable.

AGARICUS PROCERUS.—*Scop.*

THE PARASOL AGARIC.

BOTANICAL CHARACTERS.

Pileus fleshy, ovate when young, then companulate, and afterwards expanded and umbonate (blunt pointed), from 3 to 7 inches across. Cuticle more or less brown, entire over the umbo but torn into patches, or scales which become more and more separated as they approach the margin. Flesh, white.

Gills unconnected with the stem, fixed to a collar on the pileus surrounding its top.

Ring persistant, loose on the stem.

Stem, 6 or 8 inches high, tapering upwards from a pear-like bulb at the root, hollow with loose pith; whiteish brown, but more or less variegated with small and close-pressed scales.

The elegant and striking appearance of this Agaric has procured for it many names; *Fungo parasole* in Italy, *Parasole schwamm* in Germany from its general shape; *Gambaltien*, *Fonz de la gamba lunga*, or *Tall agaric*, from the length of its stalk; *Clypeatus* from its pointed, or umbonated, top; *Coleuvrée*, or *Columbrinus*, from the snake-like markings on its stem; and *Capilan*, or *Scaly mushroom* from the numerous dry brown scales of the cuticle.

The Illustration given represents rather a small specimen of the ordinary Parasol Agaric of our lowland fields and orchards. It is intermediate as to size and the colour of the cuticle between the parasol fungus of higher ground which is smaller and almost white, with the cuticle of the pileus divided into rough patches rather than ordinary scales; and that of the woods and hedgerows which is usually larger in every way, and with the scales of the cuticle much larger and deeper in colour. In the light-coloured specimens, too, the stem is almost white, but nevertheless, if closely examined, it will still be found to be covered with minute scales arranged in the same snake-like manner.

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The form of Parasol Agaric represented grows solitarily, or a few together, and is widely spread through the county. It is more common than the larger varieties, and its flavour is much superior to them. The form usually represented by authors is the one of larger size, and more coarse in growth. The scales are dark in colour, but are usually more widely separated, showing the pileus between them almost white. The same general characters mark all the varieties, and with common care no mistake can be made.

Whenever an agaric on *a long stalk, enlarged at the base*, presents *a dry cuticle* more or less *scaly*, a darker coloured *umbonated top*, and *a moveable ring*, it must be *Agaricus procerus*, the Parasol Agaric, and it may be gathered and eaten without fear. When the whiteish flesh of this agaric is bruised it shows a light reddish colour.

There are but two other agarics that at all resemble it, and both are edible. One about the same size, is the *Agaricus rachodes*. It is not generally considered so good in flavour as the *procerus*. Mrs. Hussey, however, says plainly, "if *Agaricus procerus* is the king of Edible Funguses, *Agaricus rachodes* is an excellent viceroy." The other is the *Agaricus excoriatus*, a very much smaller fungus, with a more slender habit, a shorter stem, and no true bulb at the base. This elegant little fungus is also very good eating.

The Parasol Agaric has a very wide range of growth. It is a common fungus, and is in high request all over the Continent.

OPINIONS ON THE MERITS OF AGARICUS PROCERUS AS AN EDIBLE FUNGUS.

"Servie sur toutes les tables, elle est bonne à toute sauce" (M. Thore).

"Il est peu de champignons, aussi légers, aussi délicats, aussi faciles à digérer. Il a peu de chair, mais il est trés savoureux, d'une odeur douce et fine. Son usage est trés répandu. Plus d'un menage champêtre en fait presque sa nouriture pendant plusieurs semaines" (M. Roques).

"Elle est d'une saveur trés agréeable et d'une chair tendre, trés délicate et trés bonne à manger. Les amateurs la préfèrent même au champignon de couche, comme ayant une chair plus fine et etant beaucoup plus légère sur l'estomac" (M. Paulet).

"A most excellent mushroom, of a delicate flavour, and it must be considered a most useful species" (The Rev. M. J. Berkeley).

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"Were its excellent qualities better known here, they could not fail to secure it a general reception into our best kitchens, and a frequent place among our side dishes at table" (Dr. Badham).

"Although it has but little flesh it is very savoury and of an excellent odour" (M. C. Cooke).

"The *agaricus procerus* has a piquant and full fleshy flavour, that would always make it a favourite at the dinner table, if carefully cooked" (Edwin Lees).

"If once tried it must please the most fastidious" (Worthington G. Smith).

"The king of mushrooms" (Mrs. Hussey).

There can be no question but that, when young and quickly grown, the Parasol Agaric is a delicious fungus. It has a high and delicate flavour without the heavy richness which belongs to the ordinary field mushroom. The writer has prevailed on many persons to try it; all without exception have liked it, and about one third of the number have thought it quite equal, and some have proclaimed it superior to the mushroom itself.

MODES OF COOKING THE AGARICUS PROCERUS.

The Parasol Agaric may be cooked in any way and is excellent in all.

"Comme il est très léger et très délicat, il faut le faire sauter dans l'huile fine aprés l'avoir assaisonné d'un point d'ail, de poivre, et de sel; en quelques instants il est cuit. On le mange aussi en fricassée de poulet, cuit sur le gril, ou dans le tourtière avec de buerre, de fines herbes, de poivre, de sel, et de la chapelure de pain; on ne mange point le tige, elle est d'une texture coriacé."

(M. Roques).

1.—BROILED PROCERUS.

Remove the scales and stalks from the Agarics, and broil lightly over a clear fire on both sides for a few minutes; arrange them on a dish over fresh-made, well-divided toast; sprinkle with pepper and salt, and put a small piece of butter on each; set before a brisk fire to melt the butter, and serve up quickly.

If the cottager would toast his bacon over the broiled mushrooms the butter would be saved.

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2.—BAKED PROCERUS.

Remove the scales and stalks from the Agarics, and place them in layers in a dish; put a little butter on each, and season with pepper and salt. Cover lightly and bake for 20 minutes or half an hour, according to the number placed in the dish. Put them on hot toast in a hot dish. Pour the hot sauce over them, and serve up quickly.

3.—STEWED PROCERUS.

Remove the scales and stalks from freshly gathered Agarics and stew them for twenty minutes in milk and water, which will be improved by a little good gravy; then season with pepper and salt, and add a blade of mace if desired. Thicken the same with a spoonful of flour, a little cream, or the yolk of an egg. Boil for a few minutes, and serve up quickly in a hot well-covered dish.

4.—AGARICS DELICATELY STEWED.

Remove the stalks and scales from young half grown Agarics, and throw each one as you do so into a basin of fresh water slightly acidulated with the juice of a lemon, or a little good vinegar. When all are prepared, remove them from the water, and put them into a stew-pan with a very small piece of fresh butter. Sprinkle with white pepper and salt, and add a little lemon juice. Cover up closely, and stew for half-an-hour. Then add a spoonful of flour, with sufficient cream, or cream and milk, until the same has the thickness of cream. Season to taste, and stew again gently until the agarics are perfectly tender. Remove all the butter from the surface, and serve in a hot dish, garnished with slices of lemon.

A little mace, nutmeg, or ketchup may be added; but there are those who think that spice spoils the mushroom flavour.

5.—AGARIC SAUCE.

Chop up about half a pint of young Agarics, pepper and salt, and add an ounce of butter rolled in flour. Put in a stew-pan over a slow fire for a few minutes; add half-a-pint of milk, or, better still, cream, and boil gently, stirring all the time until it is sufficiently thick and smooth. Pour round boiled fowls or rabbits, or any light fricasée.

Beef or veal stock may be used when a brown sauce is required; and some will think a little mace, or nutmeg, or a few drops of Indian Soy, or a little Harvey Sauce, a good addition. The brown sauce is excellent for steaks, cutlets, game, or any kind of râgouts.

6.—SCALLOPED AGARIC.

Mince young fresh Agarics, season with pepper, salt, and a little lemon juice, add a little butter, and stew in a warm oven for ten minutes, then put them in the scallop tin, layer by layer with fresh bread crumbs, moistened with milk, cream, or good gravy; bake for five minutes, and brown well before a quick fire.

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7.—COTTAGERS' PROCERUS PIE.

Cut fresh Agarics in small pieces, and cover the bottom of a pie dish. Pepper, salt, and place on them small shreds of fresh bacon, then put a layer of mashed potatoes, and so fill the dish layer by layer, with a cover of mashed potatoes for the crust. Bake well for half-an-hour, and brown before a quick fire.

8.—AGARIC OMELETTE.

Mince some young fresh Agarics; season with pepper and salt; add butter and set them in the oven whilst you whisk well the whites and yolks of half a dozen eggs; then put two ounces of butter into the frying-pan, and heat until it begins to brown; having again well whisked up the eggs with three tablespoonfuls of the prepared Agarics and a little milk, pour it lightly into the boiling butter; stir one way, and fry on one side only for five or six minutes; drain it from the fat; roll it up and serve quickly on a hot well covered dish.

9.—A LA PROVENÇALE.

"Steep for two hours in oil, with some salt, pepper, and a little garlic; then toss up in a small stew-pan over a brisk fire, with parsley chopped, and a little lemon juice."—*Dr. Badham.*

10.—POTTED PROCERUS.

Remove the scales and stalks from young fresh Agarics; sprinkle with pepper and salt and set aside for three or four hours; then place them in stew-pan with the a liquor that will have exuded and stew until dry; next fry in butter for a few minutes; put them into small jars, and when cold pour in as much butter melted as will just cover them; when again cold, pour on a little melted suet and tie down with bladder.

When required for use, soak them for two or three hours in a little warm milk and water, and stew with milk, or cream, or stock, and use it in any way that may be required.

11.—ESSENCE OF AGARIC.

Sprinkle young but full grown Agarics with salt, and let them stand for six hours. Then beat them well up, and the next day strain off the liquor, and boil very slowly until it is reduced to one half the quantity.

This essence will not keep long, but is much preferable to ketchup, where the delicate flavour of the Agaric is overpowered by spice. Add to it one-eighth part of good French brandy, or half its quantity of any wine, bottle carefully, and it will then keep for any reasonable time.

12.—AGARIC KETCHUP.

Place Agarics of as large a size as you can procure, but which are not worm-eaten, layer by layer in a deep pan, sprinkling each layer as it is put in with a little salt. The next day stir them well up several times so as to mash and extract their juice. On the third day strain off the liquor,

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measure, and boil for ten minutes, and then to every pint of the liquor add half an ounce of black pepper, a quarter of an ounce of bruised ginger root, a blade of mace, a clove or two, and a teaspoonful of mustard seed. Boil again for half an hour, put in two or three bay leaves, and set aside till quite cold. Pass through a strainer, and bottle; cork well, and dip the ends in resin. A very little Chili vinegar is an improvement, and some add a glass of port wine or strong ale to every bottle.

Care should be taken that the spice is not added so abundantly as to overpower the true flavour of the Agaric. A careful cook will keep back a little of the simple boiled liquor to guard against this danger; a good one will always avoid it. "Doctors weigh their things," said a capital cook, "but I go by taste." But then like poets, good cooks of this order must be born so, they are not to be made.

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DIVISION 8.—LACTARIUS (Milky).—*Fries.*

(2). Aromatic; gills becoming pallid; milk always coloured.

LACTARIUS DELICIOSUS.—*Fries.*

THE ORANGE, OR RED MILK AGARIC.

BOTANICAL CHARACTERS.

Pileus smooth, fleshy, umbilicate, of a dull rufous orange, turning pallid from exposure to light and air, but zoned with concentric circles of a brighter hue; margin smooth, at first involute, and then becoming expanded; from three to five inches across; flesh firm, full of orange red milk, which turns green on exposure to the air, as does any part of the plant when bruised.

Gills decurrent. Narrow, each dividing into two, three several times from the stem to the edge of the pileus. Of a dull yellow by reflected light, but being translucent, the red milk shines brightly through them.

Stem from one to three inches high, slightly bent and tapering downwards; solid, becoming more or less hollow with age; short hairs at the base; sometimes slightly pitted (scrobiculate).

The Illustration represents a fungus of an average size, gathered in dull weather, and therefore of a high colour.

There is no possibility of mistaking this fungus. It is the only one with the *orange red milk*, and which *turns green when bruised.* These properties distinguish it at once from *Lactarius torminosus* or *necator*, the only fungus which in any way resembles it.

This acrid Fungus *Lactarius torminosus* is somewhat similar in shape and size, and is also zoned. But the involute edges of the pileus are bearded with close hairs. It is of a much paler colour, and with gills of a dirty white. The milk, also, is white, acrid, and unchangeable in colour.

The Orange Milk Agaric is not uncommon in Herefordshire. It chiefly affects the Scotch fir tree, and is to be found generally beneath the drip of the branches around the tree. It is also found in hedgerows occasionally, but is most abundant in plantations of Scotch fir or larch.

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OPINIONS ON THE MERITS OF LACTARIUS DELICIOSUS AS AN EDIBLE FUNGUS.

"The market of Marseilles," says Sir James Smith in his tour, "exhibited a prodigious quantity of *Lactarius deliciosus*, the most delicious mushroom known."

"This is one of the best agarics with which I am acquainted, fully deserving both its name and the estimation in which it is held abroad. It reminds me of tender lamb's kidneys."—*Dr. Badham.*

"Dr. Badham stayed with me once, and we had all sorts of things cooked. At last we got *Lactarius deliciosus*, and my cook said she was sure if we eat it we should be poisoned, and she absolutely refused to cook it. It is one which grows in very great abundance in fir woods occasionally; and I can positively state myself, having partaken of it, that it is most encellent."—*The Rev. M. J. Berkeley.*

"Very luscious eating, full of rich gravy, with a little of the flavour of mussels."—*Sowerby.*

"When cooked with taste and care it is one of the greatest delicacies of the vegetable kingdom, its flesh being more crisp and solid than many other species."—*Worthington G. Smith.*

"The rich gravy it produces is its chief characteristic, and hence it commends itself to make a rich gravy sauce, or as an ingredient in soups. It requires delicate cooking, for though fleshy it becomes tough if kept on the fire till all the juice is exuded. Baking is perhaps the best process for this Agaric to pass through. It should be dressed when fresh and pulpy."—*Edwin Lees.*

"Cook them well, and you will have something better than kidneys, which they much resemble both in flavour and consistence."—*Mrs. Hussey.*

The Orange-milk Agaric is certainly very good eating; it is firm in substance, good in flavour, and when served with gravy, not unlike the kidney it is compared to. The writer's boys gather it whenever they can with as much avidity as they would the ordinary field mushroom.

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MODES OF COOKING LACTARIUS DELICIOSUS.

13.—STEWED DELICIOSUS.

"The tourtière (or pie-dish) method of cooking, suits *Lactarius deliciosus* best, as it is firm and crisp in substance. Be careful to use only sound specimens. Reduce them by cutting across to one uniform bulk. Place the pieces in a pie-dish, with a little pepper and salt, and a small bit of butter on each side every slice. Tie a paper over the dish, and bake gently for three-quarters of an hour. Serve them up in the same hot dish."—*Mrs. Hussey.*

14.—DELICIOSUS PIE.

Pepper and salt slices of the agaric, and place them in layers with thin slices of fresh bacon, until a small pie-dish is full; cover with a crust of pastry or mashed potatoes, and bake gently for three-quarters of an hour. If with potatoe crust, brown nicely before a quick fire.

15.—DELICIOSUS PUDDING.

Cut the agaric into small pieces; add similar pieces of bacon, pepper and salt, and add a little garlic or spice; surround with crust, and boil three-quarters of an hour.

16.—FRIED DELICIOSUS.

Fry in slices, properly seasoned with butter, or bacon and gravy; and serve up hot with sippets of toast. A steak in addition is a great improvement.

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DIVISION 12.—MARASMIUS.—*Fries.*

Pileus, tough but fleshy; margin, at first, involute; mycelium floccose.

MIRASMIUS OREADES.—*Fries.*

FAIRY-RING AGARIC—SCOTCH BONNETS.

BOTANICAL CHARACTERS.

Pileus smooth, fleshy, convex, subumbonate, generally more or less compressed or sinuate; tough, coriaceous, elastic, wrinkled: when water-soaked brown, when dry of a buff or cream colour; the umbo often remaining red brown, as if scorched.

Gills free, distant, ventricose, of the same tint as the pileus but more pale.

Stem equal, solid, twisted, very tough and fibrous, of a pale silky-white colour.

The Illustration shows a well-grown full-sized Fairy-ring Champignon with others of younger growth. Below these, the sections given represent all the Funguses which in any way resemble *M. Oreades*, and in the forms in which they do so most nearly.

The ground colour of all is similar, but there is really no difficulty in distinguishing them. The stem of *Agaricus dryophilus* is quite hollow, and it grows most freely on lawns late in October and November when the *M. Oreades* is over. The *M. peronatus* grows chiefly in woods and has a flat pileus and long silky hairs on and at the base of its stem; and the *M. urens* the most acrid of all, usually grows in woods though sometimes in the fairy-ring. However, its flat top and narrow dark grey gills quickly becoming black, cause it to be readily distinguished anywhere.

The Fairy-ring Agaric is a valuable little fungus, and common on almost every lawn. In hilly pastures it generally appears in broad brown patches, either circular or forming a portion of a circle.

OPINIONS ON THE MERITS OF MARASMIUS OREADES AS AN EDIBLE FUNGUS.

As far back as 1792, it is observed by Dr. Withering in his "British Plants," that "this Agaric may be procured plentifully, and its fine flavour will probably soon introduce it to our tables, particularly in catchups and in powder, forms in which its toughness is no objection to its use."

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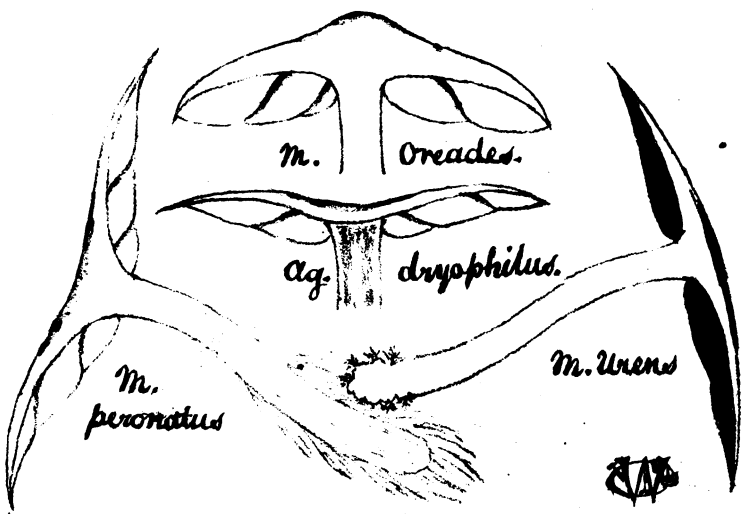
Marasmius oreades

Fairy-ring champignon. Scotch bonnets.



Sections of allied species.

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"On the Continent this species has long been considered edible, but on account of its coriaceous texture it is dried, and employed in the form of powder, to season various made-dishes."

Dr. Greville.

"The common Fairy-ring Champignon is the best of all our Funguses, yet there is scarcely one person in a thousand who dare venture to use it. With common observation no mistake need be made with regard to it. It has an extremely fine flavour, and makes perhaps the very best ketchup that there is."

Rev. M. J. Berkeley.

"An excellent flavour as good as that of most funguses."

Dr. Badham.

There is scarcely a more delicious fungus than the Champignon, and the chance of confounding other species with it, is more imaginary than real."

M. C. Cooke,

"The exquisitely rich and delicious flavour of this species when broiled with butter must be tasted to be understood."

Worthington G. Smith.

"It should be stewed with pepper and butter and then it makes an agreeable condiment. I should also recommend it for pickling. It might be used as an ingredient in soups all through the year, as its tough nature allows it to be strung up in quantities like onions. This is a very delicious Agaric beyond question, and the abundance in which it everywhere grows makes it a very valuable one. The only drawback is its tendency to toughness, which is, however, easily to be surmounted by proper cooking."

Edwin Lees.

MODES OF COOKING MARASMIUS OREADES.

This excellent Agaric, which may be procured in any quantity almost every autumn, is useful in several ways. It may be eaten fresh, cooked in a variety of ways; it may be dried for future use, whole or in powder; it makes a very delicious pickle; and a ketchup of great strength and excellent flavour.

17.—BROILED CHAMPIGNON.

Broil a few minutes and before a quick fire, when seasoned with pepper, salt, and butter; serve hot, on fresh made toast.

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18.—GENERAL USE.

"Cut in small pieces and seasoned it makes an excellent addition to stews, hashes, or fried meats, but it should only be added a few minutes before serving, as the aroma is dissipated by overcooking. It is the mushroom used in the French *à la mode* beef shops in London."

Dr. Badham.

When stewed, the Champignons require rather longer time, to ensure their being made perfectly tender.

It is readily dried by removing the stems from the fungus, threading them on a string, and hanging them up in a dry, airy place.

"When dried, it may be kept for years without losing any of its aroma or goodness, which, on the contrary, become improved by the process, so as, in fact, to impart more flavour to the dish than would have been imparted by the fresh fungus: though it is not to be denied that the flesh then becomes coriaceous (or tough) and less easy of digestion."

Dr. Badham.

19.—CHAMPIGNON POWDER.

Put the champignons in a stew-pan with a little mace and a few cloves, and a sprinkling of white pepper. Simmer, and shake constantly to prevent burning, until any liquor that may exude is dried up again. Dry thoroughly in a warm oven until they will easily powder. Put the dried Agaric, or the powder, into wide-mouthed glass bottles, and store in a dry place.

It will keep any length of time. A teaspoonful added to any soup, or gravy, or sauce, just before the last boil is given, will produce a very fine mushroom flavour.

20.—PICKLED CHAMPIGNONS.

Collect fresh buttons of the Fairy-ring Agaric and use them at once. Cut off the stems quite close and throw each one as you do it into a basin of water with a spoonful of salt in. Drain them from it quickly afterwards and place them on a soft cloth to dry. For each quart of buttons thus prepared take nearly a quart of pale white wine vinegar and add to it a heaped teaspoonful of salt, half an ounce of whole white pepper, an ounce of ginger-root bruised, two large blades of mace, and a fourth of a saltspoon of cayenne pepper tied in a small piece of muslin. When this pickle boils throw in the Agarics and boil them in it over a clear fire moderately fast from six to nine minutes. When tolerably tender put them into *warm* widemouthed bottles, and divide the spice equally amongst them—when perfectly cold cork well, or tie skins and paper over them. Store in a dry place and keep out the frost.

Full sized champignons may be pickled exactly in the same way, but will require longer boiling, until, indeed, they become tender—(Modified from Miss Acton).

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21.—CHAMPIGNONS QUICKLY PICKLED.

Place the prepared buttons in bottles with a blade of mace, a teaspoonful of peppercorns and a teaspoonful of mustard seed in each, and cover with the strongest white pickling vinegar, boiling hot. Cork or tie down as before, but do not expect it to keep above three months.

The following condiment, says Dr. Badham, is excellent for all funguses when eaten alone.

22.—STERBECK'S WHITE MUSTARD.

"Bruise in a mortar some sweet almonds with a little water, then add salt, pepper, and some lemon juice; rub well together until the whole is of the consistence of common mustard."

The writer has much pleasure here in expressing his thanks to Edwin Lees, Esq., F.L.S., &c., of Worcester, to whose instruction he is chiefly indebted for such practical knowledge as he may possess on Funguses, and therefore for many a pleasant ramble, and many a savoury dish of them at the table. He has been greatly assisted also by the interesting and well-written work of the late Dr. Badham on "Esculent Funguses," a book that all who are interested in the subject, and who wish to enjoy them safely, should not fail to procure. At the same time he must make his acknowledgements to the Rev. M. J. Berkeley, whose classification and nomenclature—as given in his valuable and standard work "The Outlines of British Fungology"—he has followed throughout. And lastly he has to express his own thanks and that of the members of the Club generally to those ladies who have so beautifully coloured the lithographic prints. Without their help these exact pictures could not have been procured. They will give an interest, and a value to the Transactions, which cannot fail to be generally appreciated.

The Bev. T. H. Bird would like to ask Dr. Bull plainly whether he had eaten the Funguses referred to in the paper, and if so, what he really thought of them.

Dr. Bull said he certainly had on very many occasions. He always gathered the *Procerus* and *Deliciosus* whenever he had the opportunity, and should no more think of passing them by than he would the ordinary mushroom. He knew now nearly twenty Edible Funguses, and never went out in the late summer or autumn months without finding some good fungus to eat, though he might not find the common mushroom. They varied very much in taste and flavour —each had its own peculiarities—some he thought excellent, and some he did not care much for. He had not had much personal experience with the Fairy-ring Champignon, for common as it usually is, singularly enough there were none last autumn and he was disappointed. There could be no doubt, however, of its excellence though it was of a tougher texture than the others.

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Mr. EDWIN LEES said that he would supplement the admirable paper just read by Dr. Bull with a few remarks. The season, unfortunately, had not permitted them to partake of a dish of those luxuries so highly commended by his zealous friend, but he had no doubt that at a succeeding summer or autumnal meeting he would take care that they should have such an ample supply as to be fully able to judge for themselves as to the taste of the indicated dainties, and rejoice that they had the opportunity of doing so. Dr. Bull had only cursorily touched upon the appearance of Fairy Rings, which was a curious matter in itself, for although numerous theories had been proposed upon the subject, no one had hitherto published any elucidation as to their cause that could be fully relied on. They were all familiar with those circles in meadows and pastures, popularly called "Fairy Rings," and he wished particularly to call the attention of the members of the Woolhope Club to them, as the investigation would be of advantage to them in the savoury diet they would thus obtain; for Agarics of several species, at one time or other occupied the outer line of these rings. They had been alluded to by Shakspeare, who had expressed not only the popular opinion of the times in which he lived respecting them, but had thus briefly given the result of his own observation:—

> "The nimble elves
> That do by moonshine *green sour ringlets make*,
> Whereof the ewe bites not; whose pastime 'tis
> To make the midnight mushrooms."

This showed close observation in the immortal bard, though Sir William Guise, the President of the Cotteswold Club, in a letter to him (Mr. Lees) on the subject of Fairy Rings, had denied what Shakspeare had said, and asserted that he had seen sheep feeding in the area of the rings. This might be true as to the uncontaminated *area* of the rings, but the poet's remark had reference to the "sour ringlets," or *edge of the circle*, in which the fairies were supposed to have danced, and where the "midnight mushrooms" sprung up. A few years since, when in the vicinity of Stratford-on-Avon, where Shakspeare lived, he had an opportunity of verifying the observation of the Warwickshire bard. In his way to dine with a friend at Welford, the path from Stratford led him through a neglected meadow where there were a considerable number of Fairy Rings, several of them then containing a quantity of the delicately-flavoured species named *Agaricus Gambosus*, of which he gathered a supply to enrich his friend's dinner-table, though the cook at first strongly demurred to using them; but the party when the Agarics were served up all pronounced them as most excellent in flavour. In the meadows mentioned were a flock of sheep, and it was most curious to remark, that though the meadow was pretty closely nibbled all over, there was an exception in the outer circle of the rings, all of which were occupied by a dense growth of the coarse grass, called by naturalists *Brachypodium pinnatum*, and which the sheep in their grazing had left altogether untouched. Here, then, Shakspeare, tested on his own ground, was found true to nature. In fact the *Brachypodium pinnatum* is a rough grass,

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growing mostly in waste spots, and disliked not only by sheep but cattle. But though this particular grass was not to be found in all fairy ringlets, yet the outer circle in the second year of its formation was almost certain to be occupied by some taller and rougher grass than what formed the turf of the area; so that he had often noticed in May, even in meadows of mowing grass, that the fairy rings were observable some distance off by the taller and coarser grass that formed the outer circle. It was a point worth noticing that the agarics of fairy rings, often most copious and beautiful in an autumnal morning, were all of an innocuous nature, many exquisite in flavour, and might therefore be partaken of without danger or fear. The Funguses tenanting fairy rings might be much further dilated upon, but he would say no more at present than touch upon their utility in adding an agreeable condiment to our diet. Burke had said that the man who had made only a blade of grass grow on a spot where it had never grown before, was a benefactor to his country, and so was any man who added to its store of food. Dr. Bull did not indeed profess to grow Agarics, but he showed where they did grow, how they could be distinguished, and the advantage of using them as food at the season when they appeared in profusion. He had thus not only approved himself to the Woolhope Club, of which he was so indefatigable a member, but humanity might ultimately be indebted to him in calling their attention to a cheap additional supply to the daily resources of life. If the members of the Woolhope Club would not only take advantage of the suggestions that Dr. Bull had made themselves, but instruct their poorer neighbours as to the use of Fungus food and remove their prejudices respecting it, an advantage would arise to the community in Herefordshire which, when fully appreciated, would redound to the credit of the Club, and prove that while enjoying the study of Nature, they were not selfish in their pleasures, but anxious by their observations to benefit all around them to the utmost of their power (cheers).

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GEOLOGY OF THE WOOLHOPE DISTRICT.

By the Rev. ROBERT DIXON, M.A.

Ξυνώμοσαν γὰρ, ὄντες ἔχθιστοι τὸ πρὶν,
Πῦρ καὶ θάλασσα. *Æsch. Agam.*, 650.

For Fire and Ocean, erst most deadly foes,
Swore fast alliance. *Eng. Trans.*

The remarkable district from which our club derives its name has already been fully described by Sir R. Murchison, in the "Silurian System," and by Professor Phillips in the "Memoirs of the Geological Survey"; these books, however, besides not being easily accessible, are somewhat out of date in the nomenclature of rocks and fossils. The new edition of "Siluria" only refers incidentally to the district. It was felt, therefore, that notwithstanding the existence of these standard works, there was still wanting a plain account of the district, written with the object of enabling those who are but moderately conversant with the principles of geology to understand and work out for themselves its details: this want I have attempted to supply.

GENERAL ACCOUNT,

The Woolhope district presents the phenomenon of a valley of elevation, the most symmetrical according to Murchison in the British Isles: even the world-wide traveller Humboldt has deigned to refer to it in the "Cosmos" (vol. v., page 231, ed. Bohn), as an example of one of the less common results of what he calls Vulcanicity. These valleys are formed by the upheaval of a tract of country by a force originating in the earth's interior round an axis, accompanied by a removal by the action of water of the chaotic fragments thus torn from the main mass. It is evident that the extent of the upheaval and the depth of the stratified beds, which rise to the surface, will depend upon the intensity of the uplifting force, and the result will be that earlier deposited beds will be stripped of their covering, and appear on the surface, while the overlying beds will form an escarped ridge encircling and enclosing a valley. The beds underlying the Old Red Sandstone of Herefordshire are as follows, with the maximum thickness in our district, as deduced from the vertical section of the survey:—

		feet.
LUDLOW Series	Downton Sandstone	82
	Upper Ludlow	128
	Aymestry Rock	40
	Lower Ludlow	694
WENLOCK Series	Wenlock Limestone	148
	Wenlock Shale	1084
	Woolhope Limestone and Shale	208
Upper Llandovery Sandstone (May Hill)	Base not seen.	

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These formations have one after another been rent asunder, and thrown back as far down as the Woolhope beds: there the disruption has ceased, and a mass of sandstone dislocated in many places forms a dome-shaped covering to the unseen agent that has reared our picturesque home. From the fact that Upper Llandovery beds lie always unconformably on whatever Lower Silurian rocks they meet, indicating thereby a complete alteration of geographical conditions in the Silurian epoch, we may infer with fair confidence that the upheaving force was brought to bear immediately on this formation. But our district is more than a valley of elevation: water, another great geological agent, has done further work than removing the fragments rent on all sides from the continuous mass. The formations which we have mentioned are not of uniform character; while some, as the Aymestry, Wenlock, and Woolhope Limestones are hard compact rocks, able to present an invincible face to many a beating wave, ocean current, orriver flood; others, as the Lower Ludlow and Wenlock Shales are mud-stones, decomposing even under atmospheric influence, and these beds have been scooped out, hollowed into valleys by the wearing and denuding agency of water, which has been able to effect on them what it has failed to do on the limestones. From any eminence on the external ridge the district will tell its own marvellous history: the thickly wooded dome-shaped hill (the Haughwood) is composed of Upper Llandovery Sandstone, and has been raised some 9,000 feet from its position, due to the Silurian uplifts at Ledbury and May Hill. On it once reposed continuously the Woolhope beds, which now only line its sides; the adjacent valley is the site of the Wenlock Shale, washed out down to its present low level. The ridge in front is the Wenlock Limestone, once outstretched in a plane continuous mass, now dipping off in all directions. There is again another valley (Lower Ludlow Shales) below you denuded like the other. The rocks on which you stand once lay horizontal and in union with the rest of the encircling ridge. Behind you are the upper beds of the Ludlow series plunging beneath the Old Red Sandstone, whose boundary line is discerned by its colour so familiar to a Herefordshire eye and derived from iron oxide. This is the general account of the district. The visitor must not expect to find an exactly spherical dome, two perfect level valleys, and two concentric regular ridges, or even be baffled if he fails for some time to discriminate between the two upper limestones in looking down on the S.W. side. The important faults and dislocations will be spoken of presently. It may be remarked here, generally, that if one only reflects carefully on the complicated actions to which the rocks have been subjected he will feel surprised rather that there is so much symmetry in the district. Consider the case of flat beds of limestone and shale, upheaved as a globular protuberance with such powerful and prolonged energy, that the portions on which the force is chiefly brought to bear have been torn from the main masses, which are kept in their place by the superincumbent beds. Combine with this the agency of water in washing out the unprotected softer strata. Perfect lines of circumvallation could not be expected; if for some distance a continuous escarpment

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were presented, it would only be at the expense of some decided break, such as we find in Dormington Wood or at Lindels; in fact, the very existence of these ridges at all, instead of a series of irregular bosses, is a matter of surprise. From local reasons, also, at some points the limestone itself might fall and be denuded to the same level as the shale, as between Dormington Wood and Mordiford, leaving a few low heights to mark its place. The whole district should be carefully traversed and surveyed with the help of map, hammer, compass, and clinometer; and the practised geologist and the tyro will alike reap great benefit from the visit, for we have here presented in a small and compact area some remarkable results of the two great processes, which have mainly caused the present configuration of the earth's surface, upheaval, and denudation.

UPHEAVAL.

There cannot be the slightest doubt that the rocks visible in the Woolhope district are made up of sediment deposited upon the same sea bottom with the Upper Silurians about May Hill and between Ledbury and Malvern, and that all these are connected beneath the Old Red Sandstone with one another and with the rocks of Siluria proper: their lithological composition is the same, their fossil remains are identical, they lie in one and the same order of superposition. What we have first to investigate then is the agency which has thrust up this mass of Upper Silurian rocks through the strata which were deposited upon them. The denudation and degradation resulting from aqueous atmospheric or climatal action were, we must bear in mind, contemporaneous, so far as opportunity allowed, with the upheaval; but as the causes and processes of upheaval and denudation are entirely distinct and antagonistic, except in the fact that they have combined together to shape out our district to its present figure, it will conduce to greater clearness if we consider them separately.

The cause of the upheaval has been a continued volcanic action. Sir C. Lyell (Principles, page 577, ed. 1867) has well defined this as "the influence exerted by the heated interior of the earth on its external covering." We must keep this definition in view throughout. Geology, as all other sciences, has suffered much from its nomenclature. When volcanic action is mentioned, the thoughts of some fly off immediately to Vesuvius and Hecla, lava and scoriæ; they wish to be shown the crater. The clear sharp ridges at Woolhope do, indeed, present a remarkable resemblance to the walls of a volcano, and an able astronomer of our Club once pointed out to me the likeness between our district and the annular mountains on the surface of the moon. But at Woolhope no rock appears that is not of strictly Aqueous or sedimentary origin. If we were to probe deep enough beneath the central dome, we should doubtless find the upheaving agent in the shape of a boss of rock belonging to the Igneous class. In a quarry at Bartestree, of which more will be said hereafter, a mass of Igneous rock has been injected up a fissure in the Old Red Sandstone with so clear an evidence of connection with the axial line of the Woolhope district,

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that we cannot resist the inference that we see there an offshoot from the upheaving agent of which we are now treating. The term "Igneous rock," however, is as likely to mislead as "volcanic action." Fire, as we commonly understand the word, requires indispensably for its existence and support a free communication with the atmosphere, and we must therefore largely extend its meaning if we retain the term "Igneous rocks." The German geologists have substituted the designation "Eruptiv-gesteine" to avoid this difficulty, and also because the Metamorphic rocks, such as Gneiss, Clay-slate, &c., have doubtless been subjected to heat as well as those which we call Igneous: but this term, too, is far from perfect, for while shunning the error of an inexact specification of the mode of formation, it involves an equal neglect of preciseness with respect to the mode of appearance on the earth's surface, inasmuch as no distinction is hereby drawn between the basalts and trachytes, which were ejected in a fluid or viscous state, and the granites and porphyries, which were cooled and solidified under intense pressure before their appearance. For the latter rocks, usually called Plutonic, Professor Jukes has suggested the epithet "Irruptive," or "Intrusive," restricting "Eruptive" to the analogues of the modern lavas.

Although the Malvern rocks are largely metamorphic, that is sedimentary deposits, which have assumed a crystalline texture by heat, pressure, and other influences, which we are not yet able to comprehend, still we have abundant opportunity to study on the hills and in the valley by Eastnor the mode of occurrence and the countless varieties of these Igneous rocks. On the Clee Hill also we see a typical member of this class, basalt, which has pierced through and overflowed the Coal Measures. Some such rock as this has been the upheaving agent of the Woolhope district, and the importance of this division of the subject obliges us to consider three great questions connected with Igneous rocks. What are they composed of? Whence do they come? How do they cause these changes in the earth's surface? Microscopic examination reveals to us the minerals of which these rocks are composed as belonging to the extensive class of Silicates, and a chemical analysis resolves them into silica and various earthy and alkaline bases, alumina, potash, soda, lime, and magnesia with iron protoxide and sesquioxide. Why in some the bases, in others the silica should preponderate, has not yet been satisfactorily explained. To the question, whence they come, the only possible answer is, from the earth's interior; but recent mathematical investigations have thrown considerable doubt upon former theories about the state of matter there. M. Elie de Beaumont held that "the whole globe, with the exception of a thin envelope, much thinner in proportion than the shell to an egg, is a fused mass kept fluid by heat, but constantly cooling and contracting its dimensions." Geologists generally have maintained the same opinion: but from astronomical calculations, into which we will not now enter, Mr. Hopkins has proved that the earth's solid crust, for which a dark line is considered a sufficient representation in some manuals, cannot be less than 800 or 1,000 miles thick. Professor Thomson has reasoned from

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other data: the height of the tides and the amounts of precession and nutation demand in the earth as a whole, a rigidity greater than steel, and the fact of the comparative softness of the upper crust with which we are familiar, compels us to infer that no less thickness than half the radius would admit of these phenomena remaining as they are. Mr. Ansted, in his recent Rede lecture, regards these calculations of great importance to physical geology, and considers it probable that we shall have to explain the various phenomena of volcanoes and earthquakes as being so superficial as to have no reference to any fluid contents of the earth's interior. Sir C. Lyell promises some further information on this subject in the forthcoming second volume of the "Principles": it is not unlikely that he will accept Mr. Hopkins' admission of the possible existence *within* the earth's crust of vast lakes or seas of lava. With reference also to the third question, the method of volcanic action, our knowledge is still very imperfect; we believe that the earth has within it some certain centre or centres of heat, that under different conditions this heat manifests itself in different ways, that the causation though locally variable has been identical throughout the ages, in the lavas which roasted the black shales of Fowlet's Farm, the eruptions of Vesuvius, the Hereford earthquake, and the calamities of the West India Islands. We cannot penetrate into the secrets of Nature's subterranean laboratory: we shall probably in time become more familiar with her mysterious procedure, and phenomena which now appear paroxysmal will be reduced into order and be proved to have a cyclical relation.

At Woolhope the volcanic action has displayed itself by a continuous effort on the part of the Igneous rock to thrust itself forth from the earth; the heat has been converted into a mechanical force, which has broken the continuity of the overlying beds and severed them wide asunder; that the Upper Llandovery rocks have not been torn apart may be explained on the supposition that they were formerly more pliant than they are now; such beds, according to Lyell (Elements p. 58), may have owed their flexibility, partly to the fluid matter which they contained in their minute pores, and partly to the permeation of sea-water while they were yet submerged. A glance at Fig. 2 will show the strain to which they have been subjected.

In Fig. 1 a rough attempt has been made to explain generally the variation of dips visible in a valley of elevation. In every published section of our district I endeavoured, without success, to describe a circle to which the external ridges might be tangents; this would have been possible if the upheaval had been as in the dotted lines; I found, however, that only by producing the eastern ridge was it possible to describe such a circle, and I inferred that the axis of the force must have been perpendicular to the chord joining the points of contact *A B*. Or reversing the steps of the reasoning, it is evident that when the axis of elevation is vertical, as *f c*, the external beds will be found dipping everywhere at equal angles from the centre as *c a b—c b a*. If, however, the axis is inclined as *F C*, though the force will

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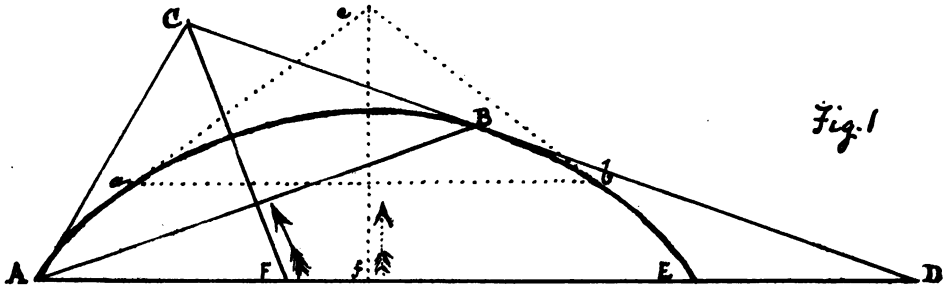
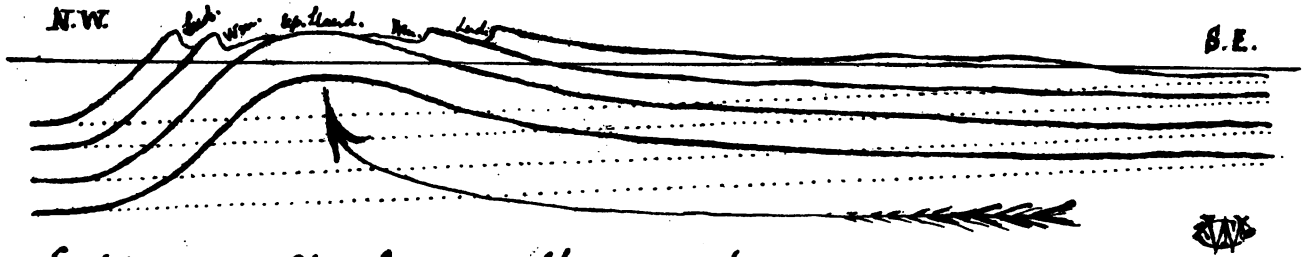


Fig. 1

Upheaval on vertical and inclined axes of elevation.

Fig. 2.



Section from Old Sefton through Haugh Wood to Gorstley Common

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upheave the strata with equal dips on both sides, if estimated by a plane, as *A B*, at right angles to the axis, yet as there will always be a tendency in the denuding agent to reduce this inclined plane to a horizontal plane, and as it is with reference to a horizontal plane that dips are measured, we may necessarily expect steeper dips, as *C A D*, on the side toward which the force points, and gentler dips, as *C D A*, away from it. It may be noticed by the way, that this inclination of the axis will be seen presently to have some bearing on the question of the clean denudation of the valley of Woolhope, and to have determined the future river-system. A comparison of the dips at Cherry Hill, near Fownhope, and Tarrington Common, being the ends of a section free from important faults, will illustrate the principle here set forth.

In Fig. 2 a section has been given of the Woolhope valley in its longest stretch. This must be regarded rather as an illustration of the history and process of the upheaval, than as the production of an accurate survey. The dotted lines represent the Upper Silurian beds, as they would have dipped from the May Hill district, had there been no Woolhope valley of elevation. The horizontal line marks the present approximately plane surface of the ground in the valleys of the Wye, Frome, and Leadon. It is at Gorstley Common that the upheaving force first indicated its intention by a protrusion of the uppermost Silurian beds, and from this point an irregular broken anticlinal ridge, seldom exposing strata below the Upper Ludlow, runs up in a general N.W. direction for five miles. This ridge has not caused any very marked geographical feature in the country, the junction line being frequently obscured by trees; its general bearing, however, may be seen from many points on the Old Red Sandstone ridge that runs parallel to it from Linton to Yatton; Mulhampton Farm House, near Upton Bishop, may especially be mentioned as affording a good view of it. So far, we have had but a mild preface of the energy of this force; it would seem to have moved too fast horizontally to have had much effect vertically; but henceforth we can trace a full display of its irresistible power; the Ludlow rocks are rent asunder, and the Wenlock strata appear; these also in their turn suffer the same fate, pushing back as they break the Ludlow rocks that overlie them, and being pushed back themselves by the Upper Llandovery beds, with whose appearance on the surface ends the Woolhope upheaval. We have been compelled to represent in Fig. 2 the axis of elevation as moving continually in the same plane; it seems probable, however, that it twisted considerably in its course, being finally turned—as far as can be judged from the dip of the beds, according to the principle indicated in Fig. 1—in the direction of Mordiford.

We may here make a calculation of the height to which the Upper Llandovery beds that form the dome have been raised by the upheaval. It is evident from an examination of Fig. 2, that this is the sum of the three following quantities:—

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	Feet.
Height of the dome above the horizontal plane.....	430
Depth of a shaft from this plane to the first dotted line = 7 miles × tan. 10°	6,517
Breadth of the Ludlow and Wenlock series	2,384
	9,331

This calculation must be taken only for what it is intended to be, an approximation to the truth, to which future corrections may be applied.

A graphic description of a similar result of volcanic action, curiously approaching accuracy in an age not renowned for physical science, may be found in Ovid's account of a mountain in the plain of Træzen. (Metam. xv. 296—306).

DENUDATION.

Under this head are comprehended the various marine fluviatile and pluvial influences, which have combined to strip off the isolated fragments of the beds, to erode the soft shales into concentric valleys, and to enlarge the fractures and dislocations. If we could imagine the strata replaced in their positions on the dotted lines in fig. 2, tons upon tons of rock would be required to fill up the gap. I once made a calculation of the weight of rocks actually removed, but I have not produced it now, because its many unsafe assumptions and general roughness rendered it of little value. Now it is with reference to the process of such denudation that the two rival schools of geologists mainly differ; the one, of which Sir C. Lyell is the acknowledged head, maintaining that causes now existing are competent to produce all the phenomena which Geology exhibits to us, that if sufficient time is granted, we need not seek any additional cause or any unusual intensity. It is well known that in the S.E. of England there is a magnificent valley of elevation called the Weald, of which our own valley is a copy in miniature. The parallelism between the beds of the two valleys is as follows:

Woolhope.	Weald.
Upper Ludlow and Aymestry rocks	Chalk and Upper Greensand
Lower Ludlow	Gault
Wenlock Limestone	Lower Greensand
Wenlock Shale	Weald Clay
Woolhope Beds and Upper Llandovery Sandstone	Hastings Sands with some protrusions of lower beds

Any one who wishes for more complete information on Sir C. Lyell's views on this subject may refer to the "Elements", chap. xix., where the denudation of the Weald is discussed; and this chapter *mutatis mutandis* may be held to convey his ideas on the denudation of the Woolhope valley. The other school, which numbers in its ranks the majority of the older geologists, although not unwilling to allow abundance of time, yet puts forward a claim for greater intensity of causation, paroxysmal violence, catastrophes and convulsions of nature. In the eloquent 20th chapter of the new edition of "Siluria," the most resolute and earnest opponent of the uniformitarian theory expresses his views on the subject of denudation, selecting our own district as

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the illustration of his opinions. "Has the advocate," he says, "who would account for all such dismemberments by long continuance only of existing causes, whether by the active erosion of breakers on a shore or by atmospheric action, ever satisfactorily accounted for the complete and entire denudation of our clean-swept valleys of elevation? Let him inspect that British model of such phenomena, the Silurian valley of elevation at Woolhope, first described by myself. What agency, I ask, except that of very powerful currents of water, could have removed every fragment of the *débris* that must have resulted, whether at one or several periods of elevation, from the destruction of all the once superposed arches of rock, and have scooped out all the detritus arising from such destruction, from the circling depressions, the central dome, flanking ridges, and former cover of those Silurian strata? And if that water had not been impelled with great force, caused by sudden uprises of these rocks from beneath the Old Red Sandstone, what other agency will account for so complete a denudation, the broken materials having only found issue by one lateral gorge, which was, we see, opened out by a great transverse fracture of the encircling ridges."—(p. 492). It is impossible to deny the cogency of these arguments; satisfied as we may be that deposition and denudation are correlative, and are measures of one another, anxious, too, as we may be to maintain the identity of former and existing causes, still we cannot be blind to the fact that on the deep sea-bed little or no change is effected by the superincumbent ocean. But in judging upon the comparative merits of these two rival theories we must not forget the hydrostatical law of the diminution of weight of bodies in water as facilitating their more speedy removal. We must always pay attention in this particular case to the inclination of the axis of elevation as affording an easier field for submarine currents to work upon; as the plane *A B*, Fig. 1, moved up towards the surface, it continually presented some unprotected protuberance for the sea to exert its force upon, and held out a challenge to it to level it to the horizontal plane *A D*. We must also remember the mighty results of the glacial epoch, and the gradual removal of the surface of the earth above the level of the glacial sea, while the inner valleys were being eroded. There must have been a long period when the dome and its two lines of circumvallation alone stood out of the water, and the present basins of the Leadon and Wye were united in one sea, when resistless waves and currents poured through the Cockshoots, and through the fissures in the Wenlock ridge, working everywhere as on coast-lines, dragging down masses of *débris* to the Mordiford gorge, and depositing them where they met the ocean driving in. There must have been a time, too, when the glacial epoch ended, and swollen rivers took the place of these sea-currents, to follow in the same course, and complete the work that had been begun, by pouring down their sediment-laden tribute to the Wye chain of lakes.

The Mordiford gorge has lately had a reminiscence of these denuding processes. The following account is from the *Hereford Journal* for May 29th,

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1811 :—"We were visited by a most tremendous storm of thunder and lightning and rain on Monday, which commenced about 3 o'clock, from an E. direction, and proceeded with great violence towards the N.W. Its fury had only the cessation of an hour from the commencement until nearly 8 o'clock, and we fear its fatal effects will be felt severely in many parts of the country. At Mordiford, near this city, the consequences have been truly lamentable. The waters collecting from the several adjoining hills of Backbury, Fownhope, &c., formed immediately above the village an irresistible torrent, and totally swept away and destroyed a corn mill, a cottage, and a barn, which in vain opposed its progress. Some of the weightier parts of the mill were carried many hundred yards from the site of the building, and much injury done to several other houses; but what is most to be lamented, the miller and his servant, the female cottager and her daughter, were all lost in the overwhelming flood, and their bodies have not yet been found. A number of pigs were drowned, and several carried across the Lugg, together with one of the heavy wheels belonging to the mill, by the force of the torrent, which absolutely made its way over the channel of the river: trees were also torn from their roots and borne along by it; in short, its effects have been most fatal and destructive on the unfortunate spot subject to its fury, and the danger it has done considering the shortness of its duration almost exceeds belief." From a subsequent paper it appears that one body was found ten days after at Ballingham. A tablet in Mordiford Church commemorates the storm, giving the additional information that the Pentelow was swollen to an extent of 180 feet in width, with a depth of 20 feet, and that many hundred tons of rock were blown up and carried through the village. I have talked with old inhabitants of Mordiford, who remember the storm, and have gathered from them that there is no exaggeration in this account, and that it is to this event that the very modern aspect of the gorge is to be attributed. Since Mordiford has been a village there has never perhaps been such an evening as this; but in the geological ages how often must the gorge have witnessed such proofs of the fearful possibilities of nature, of the singular adaptability of the Woolhope district for a display of the irresistible power of water!

PRESENT CONTOUR.

I purpose now to investigate the causes, which have prevented the perfect and regular development of the upheaval, referring for further details to the "Silurian System" and the "Memoirs of the Survey." With the exception of the curious promontory near the Putley Cockshoot, where the Aymestry ridge is broken off, there is little irregularity on the N.E. side of the district from Stoke Edith to Oldbury; but on the other side by Sollers Hope, Fownhope, Mordiford, and Dormington the case is altered. Great weight must be attached to the influence of the hard cornstone ridge below Fownhope in shutting in the beds and preventing their due expansion. At Lindels the Aymestry ridge has been squeezed out for the distance of a mile, the Wenlock limestone being faulted

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up in close contiguity with the Old Red Sandstone. In consequence of this the Lower Ludlow shales have been compressed and shut in, and for both these reasons less denuded than the corresponding beds on the other side of the district. When then the ridges passed beyond influence of the cornstones, they yielded more to the developing force; the inner one became violently twisted, and the outer one broken asunder: this dislocation may be well seen near the Nash Tump at Fownhope. The most important fault of all has taken place at Mordiford in a direction W.S.W. to E.N.E., along the present course of the Pentelow brook. I believe that according to the principles of geological dynamics it is exactly in this direction, being at right angles to the axial line of elevation, that we might have expected a fault on theory. By it all the beds have been broken across, and while the dome on the E. side of the brook moved upwards, it left deep beneath the surface on the W. side the main body with which it was united. This fault is crossed by the section in Fig. 2, but to attain clearness even at the expense of accuracy it has been unnoticed. Had not this fracture of beds happened, the Woolhope Limestone would have lined the dome all round, instead of being shut out for a quarter of a mile; the valley of Wenlock Shale, instead of being here merely nominal, would have been continued from Checkley Common to Littlehope with a gradually diminishing breadth; Marion's Hill would have been thrown forward to its rightful position opposite the boss over the toll bridge at Evenpit, and instead of the crumpled ridges with their combes from Prior's Frome to Stoke Edith, we should have had one continuous ridge dipping down at a very steep angle. From Dormington Wood to Mordiford the Wenlock ridge is almost lost, having apparently, from some cause or other, suffered the same denudation as the shales above and below it. For this reason and the irregularity occasioned by the Mordiford fault, the view of the district from Backbury is less conducive to a clear comprehension of its interesting phenomena than that from Seager or Marcle Hill. The visitor also who begins his exploration at Mordiford will feel some perplexity. In Appendix (2) I have given some suggestions for pedestrian explorers, and if this order of routes be kept, the secrets of the district will be gradually unravelled and many difficulties obviated.

The drainage has been determined by the inclination of the axis of elevation. When the district emerged from the glacial sea, the E. side was higher than the W., and Seager Hill became a watershed. The largest brook is the Pentelow, which results from the confluence, at a sharp corner of the Woolhope Limestone, of rivulets from Canwood and Dormington Wood, and after receiving a tributary from the Limekiln Bank, flows into the Lugg at Mordiford through a gorge originating with the fault, but widened by the continuous passage of many boisterous currents of salt and fresh water, laden with the *débris* of the hills and valleys. Two other brooks, made up of many streamlets, pass through smaller gorges at Fownhope and Sollers Hope. Many landslips have been caused partly by the steepness of the dip on the outside ridge and

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partly by the Walker's Earth, an unctuous clay which separates some of the upper strata. Backbury Hill shows some plain results of such accidents: but the most noticeable of all happened in Queen Elizabeth's reign, Camden giving the date 1575, but Baker placing it five years earlier; the scene of it was a spot near the Putley Cockshoot, hence called the Wonder; quaint notices of it, by early authors, may be found in the "Silurian System." In 1844 a slip of Upper Ludlow rocks took place on Dadnor's Hill, above Dormington; a full account of it is given in the *Hereford Journal* of March 20th in that year; more than three acres of ground, bearing 40 oak trees, slipped a distance of 200 yards; the effects of this slip may still be seen, although trees are rapidly hiding the fallen mass.

HAGLEY DOME.

At about 100 yards W. of Hagley House, near Lugwardine, the uppermost Silurian beds protrude through the Old Red Sandstone. This fact escaped the observation of the geological surveyors, and was first noticed by the late Mr. Scobie. By his request Mr. Strickland prepared a paper for the Geological Society, which may be found in their Quarterly Journal for November, 1852, vol. viii. It would be well if we could obtain the permission of the Geological Society to republish this paper for our own transactions, for, like all Mr. Strickland's papers, it is explicit and exhaustive. The quarry, where the protrusion was seen, is now very full of rubbish; but the visitor will have very little difficulty in making out which are the lowest strata exposed; these, he will find to be the grey Upper Ludlow schists with the characteristic fossils, and immediately above them are beds of yellow Downton Sandstone: between these two the bone-bed should be looked for; it is, indeed, but a meagre representative of the corresponding rich stratum at Ludlow, but a careful search will be rewarded by the discovery of some fine rays of *Onchus* and fragments of the remarkable crustacean *Pterygotus*. Carbonized remains of plants are very common here, and especially some small round bodies, which Dr. Hooker having determined to be spore cases of a Lycopod, has coined for the original plant the name *Pachytheca sphærica*. It is not unlikely that the Hagley Dome is but one of many protrusions of Upper Silurian rocks which remain to be discovered in the undulations of the Old Red Sandstone of our county. As at Woolhope, some igneous rock, such as is visible at Bartestree, has been the upheaving cause by volcanic action.

BARTESTREE DIKE.

In a quarry at Lowe's Hill, within half a mile S. of Bartestree chapel, a dike of greenstone injected up a fissure in the Old Red Sandstone has been cut through. A full account of this and the other trap-dike in this formation is given in "Murchison's Silurian System," p. 185. The greenstone is made up of the Silicates, hornblende, olivine, and felspar; it has altered the strata in contact with it, changing the marls into the semblance of amygdaloids. It seems probable that the same upheaval which caused the Mordiford fault,

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produced also a parallel break further on in the strata; and that at one part of this fissure (Bartestree) a stream of lava flowed up and solidified, while at another part (Shucknell) it pushed up a wedge of Ludlow rocks without emerging itself. We may notice here that fig. 2, if continued to the N.W. for two miles would pass through Bartestree Dike and Hagley Dome.

SHUCKNELL HILL.

This mass of Ludlow rocks is briefly described in the "Memoirs of the Survey." The hypothesis that it was forced up through a fissure in the Old Red Sandstone connected with the fissure at Bartestree, explains the fact that the directions of the trap-dike and the faulted edge of Shucknell are identical, viz., from W.S.W. to E.N.E. The curious shape of the hill, and the remarkable dislocation of its strata render it well worth a careful examination. In the large quarry some fair specimens of *Phacops caudatus* may be found.

PALÆONTOLOGY.

In a small isolated patch of rocks like Woolhope, we cannot expect to meet with the rarer fossils, which are usually found only where a large extent of the formation reaches the surface and is naturally or artificially exposed. There is no railway cutting in the district; the harder beds however are left in escarpments, as will be seen from fig. 2, and these have often been considerably enlarged in quarrying for limestone or road metal, but many of the Wenlock quarries have been long abandoned because of the superiority of the Howle Hill Mountain Limestone. For exposures of the softer shaly strata we must hunt in the lanes and gullies; but there, as a general rule, the excavation is far too slight to admit of many fossils being found. In an appendix is given a list of the best localities for finding the fossils of the several beds; the "Memoirs of the Geological Survey" supplied the foundation of it, but the list there given has been verified, corrected, and enlarged by many personal visits and careful inspections.

The characteristic Upper Ludlow fossils are very common: Prior's Court and the quarries in the Shucknell upcast may be especially recommended; the Aymestry rock will everywhere disappoint any one who has been accustomed to geologise in this bed at Aymestry or Downton: *Pentamerus galeatus* is common, but *P. Knightii* is very rare; it may be found at Bodenham near Much Marcle, and I have seen it in road metal said to have been brought from Shucknell; its place is often supplied here by compact slabs of *Rhynconella Wilsoni*. Nor again will the frequenters of the Leintwardine and Mochtree quarries think much of our Lower Ludlow. I have never heard of star-fish being found here; the late Mr. Scobie, our first honorary secretary, found Graptolites under Backbury Hill; I should like to discover the precise spot. Dormington Wood might of itself supply a museum with the characteristic Wenlock fossils; corals are the chief feature in these quarries, but encrinites also, brachiopodous and other shells everywhere abound. The limestone underlying the persistent

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Wenlock Shales derives its name from our district; it is extensively quarried at Scutterdine, and burnt for lime, possessing, like the lias limestone, in its admixture of silica and iron oxide, the power of setting under water; it is also largely used for road metal, and may be recognized by its hardness, deep blue colour, and veins of pink calc-spar: it has yielded many specimens of the two fine trilobites figured by Murchison, *Illænus Barriensis* and *Homalonotus delphinocephalus;* the quarrymen, whose hammers are the only ones heavy enough to detach the fossils, have been enjoined to preserve the specimens they find. The discovery of the *Actinoceras baccatum*, figured in our Fossil Sketches, ought to encourage our club to further explorations, for perhaps some other rare tenant of Silurian seas may have left his exuviæ in the elliptical area of sea-bottom, afterwards to be upheaved into the Woolhope district. Geologists want further information about these Woolhope beds, which we are justified in regarding as our own peculiar domain. Perfect fossils from the Upper Llandovery beds of Woolhope would be a great find; the Vicar of Woolhope has, I am told, some fragmentary casts of the characteristic *Pentameri*, but the exposure is so slight that a prolonged search for fossils would be, I fear, of little avail.

I cannot leave this part of my subject without referring to a question of paramount interest to a club whose sphere of action is limited to Palæozoic rocks; I mean the beginning of vertebrate life on the earth. You know what triumphs geologists have achieved in little more than thirty years; mammals have been brought down into the Upper Trias; birds have descended step by step through the Lower Eocene beds into the Upper Green sand, and lower still into the Upper Oolite slates at Solenhofen, in Bavaria; and the long-cherished theory, that reptiles had their beginning in the Permian era, was abandoned not without a struggle, when Professor Von Dechen revealed the *Archegosaurus* in the clay iron stone of the Carboniferous beds of Saarbrück. The Devonian fish have been found to have had precursors who left their exuviæ in the Ludlow bone-beds, and a member of our club, Mr. Lee, of Caerleon, has detected a fragment of *Pteraspis* in the Lower Ludlow Shales of Leintwardine. The details of these successive discoveries may be found in "Lyell's Elements" (chapter 27., Ed. 1865). I have noticed them here to remind you that the progress of our science has continually compelled palæontologists to modify one theory and abandon another at the inexorable bidding of facts, which have proved too strong for preconceptions founded insecurely on breaks, unconformability, or long unavailing search.

But here in the Lower Ludlow Shales, Sir R. Murchison bids us "rest and be thankful;" not because we have hitherto worked hard, but because there is no more work to be done. Let us hear his own words: "We may therefore fairly regard the Silurian system on the whole, and certainly all the Lower Silurian, as representing a long and early period in which no bony vertebrated animals had been called into existence" (p. 242., ed. 1867); much to the same effect we

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read in the eloquent chapter xx., to which reference has already been made in this paper; and in a postscript suggested by the newly-published "Recherches Paléontologiques" of Barrande, he says that the large development of Cephalopods in the Silurian period, and their rapid decrement in succeeding palæozoic formations, are facts "strikingly confirmatory of his established geological postulate, that with the exception of its youngest member, the Silurian system was an 'Invertebrate period' of immensely long duration" (page 506). The extreme uncertainty of this argument has been shown elsewhere in the paper on "Upper Silurian Fossils." It is not quite clear, however, what our author means by a *geological postulate;* if he means that it is axiomatic, that is, partaking of the nature of a self-evident theorem, that fish did not exist in the earlier Silurian seas, I cannot forbear expressing my grave doubts as to the accuracy of his theory. The respect and gratitude we owe to the learned and painstaking explorer of Siluria need not bind us to an unhesitating adherence to all his generalisations.

Before we consider what is axiomatic in palæontology and what is not, two preliminary observations are necessary. Since the last edition of "Siluria" appeared, fish life has been brought down to the Lower Ludlow rocks; now does not Sir R. Murchison make too light a matter of the difference between the Upper and Lower Ludlow? Lower and Upper chalk may have been deposited successively on the same deep sea-bed without oscillations of level or geographical changes, and it would be no great event to find in the lower beds a species recognised already in the upper. But such is not the case with the Ludlow rocks: the Upper Ludlow grey shales graduate imperceptibly into the Old Red Sandstone, and it would have required a very acute geologist to point out in the Ledbury tunnel the precise spot where the Silurian system ended and the Devonian began, and the ichthyolites in these uppermost beds might have been spoken of as the heralds of the numerous and varied Devonian shoals; but in passing down to the Lower Ludlow, we retrace, in the Ludlow promontory at least, a history, which in its beds of various lithological characters, alternations of limestone and shale, tells of many geographical and hydrographical changes. In spite of the nomenclature, is not the move from the Upper to the Lower Ludlow as marked as that from the Lower Ludlow to the Wenlock Shale would be? Murchison himself says—"In a general sense, the Ludlow rocks of the Silurian region of England and Wales must be simply viewed as a continuation of the argillaceous masses which prevail in the underlying Wenlock formation. Such is more particularly the case in the lower beds of this deposit," (p. 123), and in the next page, speaking of these very Lower Ludlow rocks, he says that his "chief reason for grouping them with the Ludlow rather with than with the Wenlock deposit was, that throughout the typical districts of Shropshire and Herefordshire these shales occupy the base of the ridges, the harder summits and outward slopes of which are composed of Aymestry limestone and Upper Ludlow rocks." I think then you will agree with me that Sir Roderick's theory of the non-existence of fish in the

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earlier Silurian seas has received, by Mr. Lee's discovery in the Church Hill quarry, a greater shock than he is willing to acknowledge. Again, looking at the *Pteraspis* itself (and here I speak with great diffidence, because I am only slightly acquainted with the complex organisation of this class), can we on any sound biological principles regard it as a fish likely to *begin* this class in the earth's history? The *Pteraspis* is a placo-ganoid allied to the sturgeon, of a type altogether suggestive of transition, pointing not only forwards to an advanced, but also backwards to an inferior piscine organisation.

Now Murchison's reasoning seems to be this:—Fish remains have not been found in Lower and Middle Silurian rocks; therefore, there are none in those rocks; therefore, no fishes existed in the seas under which those rocks were deposited. It appears to me, however, that three conditions ought to be satisfied before the non-existence of any given organic form in past ages can be allowed to be axiomatic: (1) that its remains must, if it lived, have been embedded in the deposit then forming; (2) that those embedded remains or traces of them must have been fossilised and preserved; (3) that a full and complete research has been made in these beds, wherever they have been deposited. Let us waive the question how far these conditions, especially the first, concern the existence of air-breathing Vertebrata in earlier times than is indicated by the deposits where their remains have been first found, and confine ourselves to fish. At first sight, it would seem self-evident that if fishes lived in a sea, their exuviæ—either their teeth or some parts of the *endo* or *exo*-skeleton would be imbedded in the deposit, but Professor Forbes' researches have thrown great doubt upon the perfectness of the record derived from the sea-bottom with respect to the marine organic life during the deposition. There are besides many existing species of fish, such as the lamprey and *Amphioxus*, certainly entitled to a place in the Vertebrate sub-kingdom, that might live in shoals in any sea, die and fall to the sea-bottom, and yet when the sediment hardened and chemical changes occurred leave no trace at all of their existence. With regard also to the third condition, we European geologists, and especially disciples of the unwearied Murchison, think far too highly of the incursions that have up to this time been made upon the earth's crust: when Asia, Africa, and America shall have been surveyed and mapped as carefully as part of Europe has been, then shall we be justified in laying down geological axioms or generalising positively from negative evidence about the commencement of any class of organic life.

One of our greatest living naturalists has well said—"For my part, I look at the geological record as a history of the world imperfectly kept and written in a changing dialect; of this history we possess the last volume alone, relating only to two or three countries. Of this volume, only here and there a short chapter has been preserved; and of each page, only here and there a few lines." These words show us what work Geology has still to do; to recover another chapter or page, or even a line, to decipher and interpret the hieroglyphs, these are the noble problems set before us: and they teach us also what should be the attitude

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of a geologist, how patient he should be, how unshackled by preconceptions his mind, what little weight he should attach to negative evidence. The time may come when the terms "Azoic," "Hypozoic," as applied to sedimentary rocks shall have been banished from the geological vocabulary, when we shall have ceased to look on our orders of strata, and theories about the range of organic life, as stereotyped for ever and applicable to every country of the globe: we may even discover that the *Eozoon Canadense* had companions of a higher grade in the Laurentian oceans, had predecessors in still earlier waters.

I have treated this question somewhat fully, because it concerns us very much, for in our field-days we often visit Wenlock rocks. I do not mean to say that we may expect to find ichthyolites at Woolhope, for there the exposure of the Shale is so slight that the chances are decidedly against us; but for the honour of the club let us make good use of our eyes and hammers whenever we meet with this or any other underlying rock; and when some years hence Sir R. Murchison publishes his fifth edition of "Siluria," as every geologist earnestly hopes he may live to do, he may acknowledge that he has at last abandoned his theory about vertebrate life by reason of the discoveries that have rewarded the zeal and patience of the Woolhope Field Club.

I have nothing more to say about Woolhope except to recommend all who have not been there to visit the district as soon as possible, and as they gaze from Backbury, Seager, Marcle, or Fownhope-hill they will appreciate the force and scientific accuracy of the words of our great modern poet:—

> There rolls the deep where grew the tree;
> O earth, what changes hast thou seen!
> There, where the long street roars, hath been
> The stillness of the central sea.

There are certainly no "long streets roaring" at Woolhope, but amid all the accessories of terrestrial inland life, hundreds of feet above and many miles away from the salt sea, lie the exuviæ of marine molluscs and reef-building polyps, silent but sure witnesses of the truths of our science, proofs of the glorious handiwork of Creative Power.

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APPENDIX (1).

List of the chief localities where the rocks are exposed and fossils may be found.

DOWNTON SANDSTONE.

Hagley	½ Mile from Lugwardine.	Fully described above.
Prior's Frome	1 mile N of Mordiford	The passage beds all along the lane from Old Sufton to Dormington are well worth studying.
Perton	1½ m. from Stoke Edith St.	In a small quarry by the roadside these beds may be clearly traced, resting upon the Upper Ludlow shaley sandstones.
Tarrington	½ m. from Stoke Edith St.	A quarry beyond the church, at the foot of the hill; it would repay further investigation (Symonds).
Much Marcle	4 miles S.E. of Woolhope	Close by the 7th milestone on the old Ross and Ledbury road — Doubtless also in many other places on this side the district the bone-bed may be found.
Gamage Ford	6 m. E. of Fawley Station.	In the short lane to Lynedown the passage beds may be well traced: the bone-bed is very thick here.
Gorstley Common	6 miles E. by N. of Ross.	Well exposed above the fish-pond.

UPPER LUDLOW.

Shucknell Hill	? m. from Withington St.	Several exposures on the side of the lane, turning up by Shucknell Farm. Many fossils may be found in the large quarry. On the north side of the hill there is a quarry with dislocations especially deserving notice.
Old Sufton	1 m. N by E of Mordiford.	Beds dipping down and overhanging the road.
Prior's Court	½ m. S. of Dormington.	Many fossils *Orthoceras bullatum. O. Ibex. Orthonota amygdalina.*
Dormington	5 miles E. of Hereford.	*Chonetes lata* abundant here with shelly substance perfect (Phillips).
Perton	1½ m. from Stoke Edith St.	The series well seen on the road up the hill.
Durley Common	2 m. from Stoke Edith St.	Very good sections up the hill by Hazle and the Hill Barn.
Bodenham	1 m. S. of Much Marcle	Numerous fossils.
Gorstley Common	6 m. E. by N. from Ross	The upper beds well exhibited.
Gamage Ford	6 m. E. of Fawley Station	Beds rich in fossils in the lane to Lynedown.
Yatton Farm	5 m. from Fawley Station	Here and at many other points in the narrow anticlinal the transition is well exhibited.
Oldbury	5 m. from Fawley Station	Several good exposures in the lanes.
Fownhope	3 m. from Holm Lacy Sta.	Curious dislocations on the road to Nuppend.

AYMESTRY ROCK.

Marion's Hill	Above Mordiford	Fair exposures.
Backbury Hill	1 mile S. of Dornington	Many fossils in the *débris*: some bands entirely composed of *Rhynconella Wilsoni.*

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Putley Cockshoot	2½ m. from Ashperton St.	Fine old quarry.
Wonder	1 mile from Putley	Good quarry.
Sleeves Oak	2 miles S.E. of Woolhope	Fine escarpment.
Ridge Hill	3 m. S.S.E. of Woolhope	Good quarry on the E. side of the hill.
Bodenham	1 m. S. of Much Marcle	*Pentamerus Knightii* has been found here.
Pound	6 m. E. by N. from Ross	Very fine quarry.
Buckenhill	1½ m. E. by S. Fownhope	Some exposures.
Fownhope	3 m. from Holm Lacy St.	Good quarry by Nuppend Mill.
Cherry Hill	2 m. from Holm Lacy St.	Very highly inclined beds.
Shucknell Hill	2 m. from Withington St.	Large quarries: some beds very fossiliferous.

LOWER LUDLOW.

Backbury Hill	1 mile S. of Dormington	Graptolites have been found in a quarry under the hill; there is also an exposure in a lane by the Clouds.
Wootten	1 m. S.E. of Dormington	The lane cuttings about here should be examined.
Winslow Mill	1 m. E. by N. of Woolhope	Exposed in the road up to Hooper's Oak.

WENLOCK LIMESTONE.

Dormington Wood	2½ m. from Stoke Edith St.	Quarries very rich in the characteristic fossils.
Canwood	2 m. S.E. of Dormington Wood	Old quarries in an opening in the ridge.
Winslow Mill	1 m. E. by N. of Woolhope	Beds exposed in the road.
Hyde	1½ miles S.E. of Woohope	Rich little quarry.
Lindels	1 mile from Sollers Hope	Quarries with many fossils.
Fownhope	3 m. from Holm Lacy St.	Long line of exposures on the Common Hill, with abundance of fossils.

WENLOCK SHALE.

Checkley Common	Under Dormington Wood	Fossiliferous exposures in some lanes and in the brook.
Woolhope	3 miles from Mordiford	Exposed in lanes to the S.
Nuppend	1 mile from Fownhope	Some exposures on the road towards Rudge End.

WOOLHOPE LIMESTONE.

Joan's Hill	2 miles E. of Mordiford	Slight exposure.
Woolhope	3 miles from Mordiford.	Many exposures round the village.
Twillis	½ mile S. of Woolhope	The dips here are remarkable.
Weslington	1 m. S.W. of Woolhope	Old quarry.
Rudge End	1½ miles from Fownhope	A small quarry by the road.
Littleshope (Scutterdine)	1½ m. E.S.E. of Mordiford	Rich quarries in constant work.

UPPER LLANDOVERY (MAY HILL).

Pound	1 mile E. of Mordiford	Cuttings in lanes in Haugh Wood.
Broadmore Common	1 mile W. of Woolhope	Road cuttings.

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APPENDIX (2).

SUGGESTIONS FOR ROUTES.

For the benefit of those members of the Club who may wish to explore the district, I purpose to give here some suggestions about the best routes. I may premise that the roads are rough and often very muddy, and that no provisions are procurable: pedestrians therefore should start well prepared. I would also recommend that the Ordnance map geologically coloured be a constant companion; it must be remembered, too, that much time is taken up in surveying the country and hammering the rocks, and that a twelve miles' walk as estimated by the map is a good day's work for the hardiest geologist. I have found it a good plan when visiting many quarries in a day to carry out a box of small adhesive numbers and affix them to the fossils when found, with references in a note book; this greatly facilitates an accurate understanding of the characteristic fossils of the several beds.

Route 1.—Train to Stoke Edith station. A walk of 1½ miles on the Ledbury road brings you to the corner of East Wood. Turn up a lane to the right to Durley Common and Hazle. There are many good exposures of the Upper Ludlow rocks as you ascend Seager Hill. Stay some time on the hill to survey the whole district. The ridge on which you stand (Aymestry Rock) may be seen continued round in both directions: the Wenlock ridge is beneath you. Over the wooded dome the two small round hills to the W.S.W. are the ends of the two ridges by Mordiford. The irregular S.W. limits of the district may be understood by tracing an imaginary line from these two hills to the prominent hill to the S. at the end of the Aymestry ridge; outside this line are Dinedor, Acornbury, Caplar, &c. After this survey, continue the walk to a break in the hill called the Putley Cockshoot; there is an old quarry near, which may be examined. The results of the landslip, already mentioned, may be seen here by a house called The Wonder. To the S. to Hooper's Oak. Descending the hill homewards, you may see in the road some exposures of the Lower Ludlow Shales. Pass through the Wenlock ridge by the gorge at Winslow-mill, where are some old quarries, and make for Woolhope. The limestone may be seen at several places in the village. Turn up to the right soon after passing the church; the road will take you over the common and through Haugh Wood, where the Upper Llandovery rocks may be seen in many places. Make for the Littlehope quarries of Woolhope limestone; some few fossils may be found here. Thence to Mordiford, noticing on the right the effects of the fault in cutting out altogether the Wenlock shale. Examine the breccia near the inn; I have found many of the rarer Brachiopods here. From Mordiford, a walk of 4½ miles will take you back to Hereford.

Route 2.—At the second milestone on the Gloucester road cross the fields to the left, and walk between Longworth and Hampton Bishop. Over the Lugg

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and the Frome. Up Larport Lane, where the transition may be noticed from the red marls to the Upper Ludlow. Ascend Backbury Hill; again carefully study the district. The prominent hills and ridges may be discerned as before from Seager. Notice how at Dormington Wood the Wenlock Limestone after preserving a long straight ridge is at last broken sharp off; you can barely distinguish it beneath you. Notice also how the valley of Wenlock Shale, with its occasional low hillocks, ceases when it reaches the line of the Mordiford fault. After searching for fossils under the hill make for the Dormington Wood quarry; you may gather here as many Wenlock corals as you please. Take the road to the N.W., and on reaching a farm-house descend the hill to the right towards Perton; some good exposures of Aymestry rock and Upper Ludlow are passed. At Perton see the Downton Sandstone with its carbonaceous layers resting on the Upper Ludlow. A walk of one and a half miles will bring you to Stoke Edith Station.

Route 3.—Train to Fawley. Walk to How Caple, and cross the hills to the new Yatton Church. Down the hill. At Welch Court you come on the Upper Ludlow; some exposures may be seen in the road. Take the first turning to the left down a lane to Gamage Ford: the bone-bed may be found here without difficulty several inches thick, with fish and crustacean remains and spore cases of the *Pachytheca sphærica*. Take the new Ledbury road; at Bodenham quarry of Upper Ludlow and Aymestry rock the *Pentamerus Knightii* has been found: some small Gasteropods and other Ludlow fossils may be obtained here. Thence to Much Marcle; ascend the hill by the old Ross road: at the VII milestone may again be seen the Downton and Upper Ludlow beds in contact. Turn to the right at the crossing and again to the left and mount the Ridge Hill. At the high prominent point the finest and clearest view of the whole district may be had. Try to discriminate the two ridges on the S.W. side: when the ploughed land is visible, there will be little difficulty in distinguishing the Silurian and Devonian formations by the colour of the soil. Turn down at Sleeve's Oak; at a little quarry in the Wenlock ridge, marked Hyde in the Ordnance Map, some good corals may be found. Cross to Woolhope. Work round the south flank of the dome, some exposures of the Woolhope Limestone may be seen. Turn off to the S.W. just beyond Rudge End to Nuppend: at a quarry by the mill many fossils may be found. Notice the many disturbances of the strata beyond this quarry. To Fownhope. Walk towards Hereford. Notice how the beds are masked with rough gravel. Cross at the Toll Bridge and thence to Holm Lacy Station.

Route 4.—To Withington station. Walk to West Hide; examine the quarries near. Cross Shucknell hill, and after a careful search in the large quarry, walk down the lane to Shucknell farm; there is another quarry here. Thence back to Wilcroft. Examine the fine high level gravel beds. A short walk will bring you to the Lowe's Hill quarry or Bartestree trap dyke. Cross

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the park and visit Hagley Dome. All the localities in this expedition have been fully described above. Return to Hereford.

Route 5.—To Mitcheldean-road Station. Up May Hill and admire the view. Down in the direction of Newent, which need not be visited; search rather for the small outcrops of the coal measures. To Gorstley Common, where the Downton sandstone and Upper Ludlow rocks, near the fishpools, should be examined. To the Pound quarries of Aymestry (?) Limestone in Linton Wood. Through the wood to Tedgewood and Upton Court. Across the fields up to Mulhampton farm-house, where a good view may be had of the long stem of the Woolhope district. Walk along the ridge to Perrystone Hill, and down the avenue into the turnpike-road. To How Caple and Fawley Station.

Route 6.—Train to Stoke Edith Station. Through the park to the Stoke Cockshoot. Turn S.E. down the Lower Ludlow valley to a break in the Wenlock ridge, near Canwood, called Botany Bay by the natives: there are some rich old limestone quarries here. Back by the road through Checkley Common, where there are a few exposures of Wenlock Shale. Follow the course of the Pentelow brook to Mordiford, noticing on the way some curious dislocations caused by the fault. When the brook is low many fossils may be found in the rocks laid bare by it. Return to Hereford.

Route 7.—Train to Holm Lacy. Cross the Toll-bridge and walk to Fownhope. Up the road, through the gorge, by Fownhope Court to Nuppend. Walk along the Wenlock ridge to the S.E. Some capital quarries are passed, nearly as rich as Dormington Wood. Observe how the Aymestry ridge has been twisted and broken. About Buckenhill some exposures of Aymestry rock may be found. Continue the walk by Sollers Hope to Lindels, where the Aymestry is squeezed out by a fault, and the two ridges of Wenlock Limestone meet with many exposures at an acute angle, showing dips in all directions. Ascend Oldbury Hill, and walk N. along the Aymestry ridge. Cross to Seager Hill, and down Tarrington Common to Stoke Edith station.

Route 8.—Walk to Mordiford. Up Marian's Hill. Down and to Old Sufton. Trace the fault at Prior's Frome, and examine the exposures, Many fossils may be found at the Ludlow quarry at Prior's Court. Thence to Dormington village, to the landslip on the side of the hill. To Stoke Edith station.

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STATEMENT of ACCOUNTS for the YEAR ENDING DECEMBER, 31st, 1867.

Dr.	£	s.	d.
Balance in National Provincial Bank	15	7	8
Treasurer's Balance	1	0	6
Subscriptions for the Year	37	0	0
Arrears for 1866	8	0	0
Sale of the nine spare copies of the Volume of Transactions	4	10	0
Hereford Savings Bank	10	0	0
	£75	18	2

Arrears of Subscriptions due, Dec. 31, 1867.

	£	s.	d.
1867	16	0	0
1866	1	10	0
1865	1	0	0
	£18	10	0

Cr.	£	s.	d.
Maps of the County, with Botanical Divisions (300) ...	9	2	6
Brass Block and Dies for the Club	3	6	0
Ladmore and Son, Photographs of Trees (750)	7	16	3
Printing 750 Mounts for ditto	1	5	0
Reports of the Malvern and Annual Meetings, from the "Hereford Times" (150)	8	3	6
Binding the Volumes of Transactions, Carriage, &c. ...	6	1	0
Reports of the Field Meetings at Colwall, Llandrindod, Craig-y-pwll-ddu, Clun, and Hereford, from the "Hereford Times (200)	8	16	0
Printing Lithographs for Transactions, Carriage, &c. ...	8	2	9
W. Phillips, for Circulars, Stationery, Stamps, &c., for the year	14	7	2
Assistant Secretary	5	0	0
Sundries, Carriage, Stamps, &c.	1	18	2
Balance in the National Provincial Bank	0	19	9
Ditto in Treasurer's hands	1	0	1
	£75	18	2

Deposited in the Hereford Savings Bank, with Interest, to 31st December, 1867, £62 18s. 10d.

ARTHUR THOMPSON, TREASURER.

Examined and found correct, March 25th, 1868.

C. WREN HOSKYNS, PRESIDENT.

T. CURLEY, VICE-PRESIDENT.

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OFFICERS FOR THE YEAR

1868.

President:

DR. M'CULLOUGH, Abergavenny.

Vice-Presidents:

CHANDOS WREN HOSKYNS, Esq., Harewood, Ross.
Rev. H. COOPER KEY, M.A., Stretton Rectory, Hereford.
JAMES RANKIN, Esq., M.A., Bryngwyn, Hereford.
T. BLASHILL, Esq., 10, Old Jewry Chambers, London.

Central Committee:

DR. BULL, Hereford.
TIMOTHY CURLEY, Esq., C.E., F.G.S., Hereford.
JOHN LLOYD, Esq., Huntington Court, Hereford.

Honorary Secretary:

REV. GEORGE H. CORNEWALL, Moccas Rectory, Hereford.

Treasurer and Assistant Secretary:

MR. A. THOMPSON, 12, St. Nicholas Street, Hereford.

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FIELD MEETINGS APPOINTED.

1868.

FRIDAY, MAY 22ND .....Hampton Court Estate.

FRIDAY, MAY 19TH .....Crumlin Viaduct and Pontypool.
(In conjunction with the Cardiff Naturalists' Society.)

TUESDAY, JULY 14th .....(Ladies' Meeting).....Penwyllt Station.

TUESDAY, JULY 28TH .....Ludlow, for Clee Hill, &c.
(To meet the Caradoc Club.)

TUESDAY, AUGUST 25TH.....Hereford.

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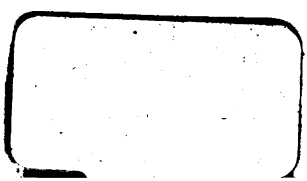

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